John THE Underwood

PRINCIPLES of Arithmetick:

WITH

Helpfull OBSERVATIONS,

making the Entrance eaſie, and the Practice pleaſant:

TEACHING

The five ordinary parts of ARITHMETICK, the uſuall way:

The performance of Multiplication and Diviſion, onely by Addition and Subtraction:
With new and notable Abridgments.

Rules of PRACTICE, with extraordinarie Helps: And therein, ſome excellent Obſervations, for the eaſie caſting up of Intereſt.

The doctrine of FRACTIONS,

The foure Rules of ARITHMETICK:

RECREATIONS extraordinary; or the eaſie performance of (ſeeming) Impoſſibilities.

By WILLIAM WEBSTER.

LONDON,
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Recensui Librum hunc cui titulus est [The Principles of Arithmetick, &c.] *in quo nihil reperio quò minùs cùm utilitate publica Imprimatur.*

Ex Ædibus Fulham.
Iul. 18. 1634. SA: BAKER.

This Booke is sold by the Author, who dwelleth in *Bearebinder lane* in *London*.

TO THE VVORSHIPFVLL

NICHOLAS CRISPE Eſquire, One of the Captaines of the Honourable Citie of LONDON:

Grace and Peace, with the addition of Health and Proſperitie.

WOrthy Sir, I have ſet forth this Treatiſe of Arithmetick out of an honeſt deſire to doe good to others, for I am perſwaded, though the volumne be not great, yet it will be very uſefull, and bring much benefit to the Common-wealth: In confidence whereof, I have preſumed humbly to preſent the Patronage of it to your Worſhip, not doubting of your favourable

acceptance, ſeeing it tendeth to the publique good, which you both favour and further, as you have (even in your yonger yeares) many waies expreſſed in works both of Pietie and charitie, wherein you follow the ſteps, and wel ſhew your ſelfe the worthy ſon of that grave and worthy Senator of this Citie, your good father, whoſe goodneſſe concurring with his greatnes, (God having alſo bleſſed him with an heart to uſe his bleſſings) hath cauſed his name to remaine as a ſweet ointment poured out; witnes (amongſt many other teſtimonies of his goodnes, charitie and religious care

for

for the furtherance of Gods glo-ry, and the good of others) the Houſe erected, dedicated, and endowed for the maintenance of the poore of MARCHFELD *the place of his birth.*

And although the prayers of thoſe many that have beene, are, and ſhall be there relieved by his bountie, need not be directed for the bettering of his bleſſed eſtate, yet no doubt but they have beene, are, and will be ſent up to heaven as interceſſors, for a bleſſing up-on his happy poſteritie, You, and Yours after you.

I hope, notwithſtanding your many buſineſſes, this volume be-

ing but little, you will be pleaſed to reade it over with obſervation, which if you doe, I doubt not, but it will recompence your paines, by informing you in ſome things that will afford you eaſe and advantage in paſſing through your manifold imployments both in your foraine and domeſtique traſique: In both which I heartily deſire Almighty GOD *to crowne your enterpriſes and proceedings with ſuch ſucceſſe as may be for his glorie, and anſwer your owne beſt expectation, wherof not doubting I humbly reſt*

Your Worſhips Servant,

WILLIAM WEBSTER.

COurteous Readers, I know not how I ſhall be cenſured, for ſetting forth this ſmall Treatiſe of Arithmetick, it being ſo plentifully taught both in Schools, and books ſet forth by worthy Authors, whoſe names I reverence, ſeeing that at their flames I have lighted my poore Candle; yet ſure, if I be rightly underſtood, I ſhall rather deſerve thankes, then incurre blame; for my purpoſe is, principally, to communicate to others that benefit which I my ſelfe have found by certain rules & obſervations of mine own, which (to my knowledg) have not yet been taught by any. For Learners (eſpecially thoſe of the meaner capacity) here is a moſt neceſſary rule

teaching only by *Addition* and *Subtraction* (which are ſmooth and eaſy) to performe *Multiplication* and *Diviſion* which are more rough and difficult; ſo that many (thereby diſcouraged) have there broken off, and proceeded no further in this excellent Art, whereby they have loſt oportunity of preferment that might elſe have befalne them for their owne good, and for the better inabling of them to have done good to others. For the incouragemẽt of ſuch I have here taught an eaſier way, whereby they may proceed in learning this Art without perplexitie, & may likewiſe gaine much eaſe in paſſing through buſineſſes, when they ſhall come to practice: For to that end I have alſo here inſerted divers abridgments,

ments, with ſundry rules and obſervations for the performance of many buſineſſes with much eaſe & advantage; & having (for this purpoſe) ſet down many examples, if amongſt them you chance to find any ſmall error hath eſcaped my pen, (being the firſt impreſſion) be favourable in your cenſure, and friendly in correcting the ſame. All the examples of *Multiplication* & *Diviſion* throughout this Treatiſe, are performed only by *Addition* and *Subtraction* in a plain & eaſie manner; and I hope the eaſe and certainty that will be found in theſe plaine rules of mine, wil be ſuch, that many both in theſe and in after times will reap much benefit by my poor indevours, which I heartily wiſh, being my chiefeſt aim in publiſhing hereof.

And thus, gentle Readers, deſiring you heedfully to read it, and judiciouſly to obſerve it, that you may learn ſuch skill in this Art, as may benefit you in humane buſineſſes, and eſpecially wiſhing you grace to guide you in divine and religious duties, I end, with the prayer of the Pſalmiſt, *So teach us to number our daies that wee may apply our hearts unto Wiſedome.*

From my houſe in Bearebinder lane *in* London.

An Epitaph to the lasting Memorie of the Worshipfull Mr Ellis Crispe,

Sometime Alderman of the Honorable Citie of London, And died Sheriffe of the said Citie in *An. D.* 1625.

Here lies his Corps, whose life a patterne was
For others imitation: and a glasse
Wherein they might behold what was amisse
In their owne lives, (not being like to his)
And like to glasse, for men through it might see
His very honest hearts integritie.
And like to glasse it also did appeare,
In that it was so spotlesse, pure, and cleare.
And like to glasse, for his good works shin'd bright,
His life was such, as lent to others, light:
Yet though his light to others clearely showne,
His bounty was much more, then was much known.
And lastly, 'twas like glasse, (which grieveth most)
In that it was so brittle, too soone lost:
And yet not lost; For when from hence estrang'd,
Then for a better life, this life he chang'd;
Where now his blessed Soule in Glory raignes,
So alwaies, by his death, a good man gaines.

To that worthy Sparke, and generous Spirit, his much *Honoured Patron.*

RIght worthy Sir, If I ſhonld freely write
in your due commendation, ſome would (gheſſe
I did but flatter; play the Paraſite,
though I in deed and truth did nothing leſſe.
To praiſe the living doth ſuſpition raiſe,
Some finiſter reſpect begets that praiſe.

But cuſtome leads, and ſo allows the ſame,
that ſince you are my gracious Patron now,
I ſhould as fairely regiſter your name,
as my beſt obſervations can allow;
Becauſe I here muſt bring you on the ſtage
For more than for a day, or yeare, or age.

Such as wel know you, know your worth is great
and know great commendations are your due,
Conceiving you to be a man compleat,
& ſince ſuch gracious thoughts are held of you,
Why may not I (uncenſured by any)
Expreſſe my thoughts ſubſcribed by ſo many?
How much are you belou'd of high and low,
how are you bleſt with ſtore of Noble friends,

Yea

Yea gracious favours he is pleas'd to ſhow,
whoſe praiſe (unparallel'd) ſo far extends.
He deigns to take ſome notice of that worth
Which your ſo actious life ſets fairly forth,

But deare Sir, let not ought that I have ſaid
diſpleaſe you, for (me thinks) I feare a check,
Let now your modeſtie be overſwaid,
& give me leave (with dues) your name to deck
A reaſon I have ſet you downe before,
If that be not enough, take this one more:

Why may not bad men hearing good mens praiſe
be taken with the love of goodneſſe too,
And ſo become the better all their daies?
ò that my praiſing you this good might doe.
(There's poſſibilitie) in hope it may,
Ile borrow leave yet ſomewhat more to ſay:

You that have now ſo faire a Progreſſe made,
and have improv'd your greener years ſo wel,
If you grow old, and ſtill in goodneſſe trade,
how will your ſtock of goodneſſe then excel?
If (with your yonger years) your age ſhal ſuit
You'l ſeem a tree, whoſe branches bend with (fruit.
Good God, the God of goodneſſe, ſo regards
both goodnes and good men, that he (in love)
With more thē with heavens glory, thē rewards

rich in this world, oft cauſing them to prove
Bleſſing them in their basket and their ſtore,
(becauſe good ſtewards found) he truſts them more.
His ſervice much is furthered by your zeale,
and ſince he ſo by you doth glory gaine,
His favours he to you doth freely deale,
for he that watereth ſo, ſhall ſure have raine:
Such ſcatteringbrings increaſ, you (ſowing) reap:
Earths bleſſings; heavē is pleas'd, on you to heap.

Yea, a good name, ſhall eke be added in,
outlaſting life; here you already have it,
Yet that a kind of new life ſhall begin,
whē your bleſt ſoul ſhal go to him that gave it,
For then your fame ſhall (like the Sun) ariſe,
And ſcarcely ſett, till it ſhall leave the skies,

Almighty God, ſtill proſper your deſignes,
live free frō loſſe, as thoſe whō heaven ſecures
Be ſtill inricht, even from the Africk Mynes,
thrive may that brave attēpt, being chiefly yours
Live may you happy long, then die in peace
And may your death, your happines increaſe,

To

To the Religious, and Vertuous, Mrs ANNE CRISPE.

WHere els could your dear ſpouſe, have
matcht with one,
That could have matcht him ſo? I think with none:
But be not emulous; why trace you him
As if you ſtriv'd his worth with yours to dim?
But ſoft and faire, 'tis not your glittering rayes
Can dim the brighter beams that he diſplayes:
Admit, the gifts of grace in you ſo ſhine,
As you were all (as is your ſoule) divine.
Yet you'l fall ſhort, and faile in your account,
If you expect your praiſe ſhould his ſurmount:
No, looke not for't, you may as well expect
That Phœbus *beames by* Luna's *ſhould be checkt.*
It's well that you (in praiſe) with him may ſhare,
Though neither you ſurpaſſe, nor yet compare.
Muſt you ('cauſe hee's admir'd) needs preſſe to be
In peoples thoughts, as gracious held as hee?
You would out-love him too, that's your ambition,
But that his love's too much to give admiſſion.
Or ſay you could, What then? you might confeſſe
'Twere but the objects ſtrong attractiveneſſe.
But now, though you were nere ſo chid before,
Yet pardon me, for now my ſpleene is ore.
'Twas but my choler, 'twas an haſtie fit
Which I am ſubject to, pray pardon it:

Nor

Nor doubt I, but you'l ſoone be reconcil'd,
For you are diſcreet, and your nature's mild.
Excuſe me now, ſince I have pardon axt,
And Ile excuſe you, you ſhall be untaxt.
Not to ore-top your Spouſe, or him out-goe,
But to out-ſtrip your ſexe, doe you ſtrive ſo;
And yet not ſo, your ends are better yet,
You doo't, that your example may beget
Like pious zeale, like vertues, like endever,
That others may (with you) be bleſt for ever.
Your Husbands name, & yours, here, long may live,
And each to other a faire luſtre give,
You bleſt in him, and he no leſſe in you,
Whoſe mutuall love wel ſhews the Text is true,
Which ſaith, that man and wife are one, for why?
Your ſoules doe ſeeme to hold a ſympathy.
(As his good angell) your endevours ſtill
Are to procure his good, prevent his ill.
Heavens providence, that one to him hath brought,
Which was not found, though' mongſt a thouſand
Go on, Grace ſtil conduct you in your waies (ſought
Till (Sainted) you ſhall ſing Jehovah's praiſe.

To

To the truely honeſt, and his very worthy loving friend, Mr Samuel Criſpe.

How ſhall I pay the debt I owe,
for kindneſſes that I have found,
Would God I could ſome paines beſtow,
that might to your content redound:
With more then thanks I would repay
Your love, if in my power it lay.

If any thing I here have penn'd,
may pleaſe, or give you ſome content,
That unto you I doe commend,
and wiſh it were more excellent:
'Twill teach you (ſure) if well read ore
Some eaſie helps, not known before.

And ſith your apprehenſion's quick.
(which well ſupplyes your eares defect)
You cannot ſlight Arithmetick,
but rather give it due reſpect:
My Rules (I hope) you'l well eſteeme,
Becauſe to you they'l eaſie ſeeme.

You, and your brother Nick (that word
me thinks becomes you, 'tis in love)
Together hold such sweet accord,
as if in both, one soule did move:
Nere did two brethren & their wives
Together lead more loving lives.

Your vertuous, mild, and modest choice,
amongst the rest deserveth praise:
How well may you in her rejoyce,
that so your love with love repayes:
'Twere strange if she therin should err
Her sister so examples her.

So wishing you earths blessings here,
and heavens full happinesse for aye,
I cease: But why should I forbeare,
till somewhat of your worth I say,
Good, just, wise, lowly, curteous, free,
You may most aptly stiled be.

To the Worſhipfull *Robert Bateman* Eſquire, Chamberlaine of the Honorable Citie of London, and Treaſurer to the Right Honourable and Illuſtrious Companie of Merchants of London, Trading to the Eaſt Indies.

GRave Sir, a thākful heart I fain would ſhew
my worthy friend have you been many a
Wherin (as we are taught) you do beſtow (day,
favours on one that can but thanks repay:
Which if I ſhould neglect, how wold that blame
Be juſtly mine, that on nine Lepers came?

Which to avoid, how gladly I imbrace
this oportunitie, that ſo I might
Your name amongſt my other frends thus place
who all frō me, may challenge thanks of right:
Take then your dues, which here I freely tender,
My harty love withall, yet all too ſlender.

But have I only taſted of your love,
and of your goodneſſe? no; but hundreds more
Many yet living, ſome now Saints above,
for which, no doubt, there's a reward in ſtore;
Which unto you ſhall never be deny'd,
You have his word for it, that never ly'd.

How much this City holds you in eſteeme,
appears, in that it hath ſuch confidence

In you, as you the meeteſt man to deeme
for places of ſuch truſt and conſequence:
Wherein your care ſupports your credit ſo,
that worthy of ſuch truſt your ſelf you ſhew

You have been able thought, and able found,
for Parlament imployment, which declares
Your wiſdome to be great, your judgment ſound
elſe were you far unfit for ſuch affaires:
Four times the Citie hath ſuch love expreſt
As you, with that ſame honour, to inveſt.

So vpright, juſt, your dealings all ſo true,
that you ſuch love, and ſuch reſpect do gaine,
As if, *Mark and behold*, did point at you;
to whom a peacefull end doth appertaine:
Your life, ſo free from guile, as if you trac'd
The ſteps of him that was ſo highly grac'd.

How are your happy daies drawn out in length,
how few are they that to your years attain,
Yet of ſuch vigour, that the want of ſtrength,
doth not (from your affairs) you yet reſtraine:
In this, the gift of temperance well appears,
Which God doth uſe to crown with length
of years.

How generally are you belov'd of all,
how doth your bounty cheriſh and relieve,
Therefore, how ſad will be your funerall,
how many eyes wil weep, & hearts then grieve

And

And yet (alas) that time cannot be far,
time having made you ſuch, as now you are.

Time brings men to old age, age to their death,
and ſo (to life) time's taken for a foe,
But yet when time hath took away the breath,
that is times worſt, it can no further goe:
It cannot hurt the ſoule, nor touch the name,
Of ſuch as you, that leave a laſting fame.

A double good's in that that good men doe,
for they doe good to others by good deeds,
And they doe good, by good example too,
which works on others, & ſo goodnes breeds:
As many have your goodneſſe taſted, ſo
May your example work on many moe.

Good men, they are not bleſt themſelves alone,
but their ſeed after them, are likewiſe bleſt,
As God on you hath many bleſſings throwne,
ſo on your ſeed ſhall his good bleſſings reſt:
May they be good (as you) that ſo they may
Like bleſſings to their ſeed likewiſe convey.

And now this my poore labours ſlender fruit,
I humbly doe preſent unto your hand,
And though (with you) it ſcarcely wel doth ſuit
yet you have ſons, whom it in ſtead may ſtand:
So may (till death) good angels with you ſtay,
And then your ſoule to endleſſe bliſſe convey.

The

THe ground of Arts, is numbers Art;
this may suffice in praise of it,
For't can be praised but in part,
when all that can is said, or writ:
The depth of it, there's none can sound,
By humane wit, it's so profound.

Numbers, doe skill in number need,
without which skill, their trades would fall,
It stands all Artists much in stead,
and is an ornament to all:
It brings Gaine, Credit, and Delight,
To study it, let this incite.

And now let none disheartened be,
for hardnesse found at first, for why,
Here such a way is taught by me,
wherein there doth no hardnesse lie:
This Booke will be your Guide, and may
Be hir'd, and had, for easie pay.

The Author to his Booke.

NOw Booke goe forth, I dare not keepe thee in
Still, least I so, should guilty be of sin;
We should doe good to others whilst we may,
Then tis not good I should too long delay
To send thee forth, lest death preventing me,
What thou here teacheſt, still untaught should be:
And I to answer for't, that should deprive
Those of that good, they know from thee derive.
Errors are hatefull, ease is much effected,
And sparing time is much to be respected:
And by those helpfull Rules that here are taught,
With certainty, ease, speed, may works be wrought.
If good by them to any shall accrew,
His be the praise, to whom all praise is due,
And not to me, though they may me survive,
And after death may keepe my name alive:
For sure I find the help by them is such,
That hoping others too will find as much:
It makes me think (perhaps) that WEBSTERS way
May now be practiz'd till the Worlds last day.

The Principles of Arithmeticke,

With helpfull obſervations.

ALthough my intent in this little Treatiſe is chiefly to teach Multiplication and Diviſion after a new and more eaſie way, then ever (to my knowledge) was yet taught by any, together with ſome of my owne obſervations; yet, becauſe I deſire that it may benefit even thoſe alſo that deſire to learne Arithmeticke and have not yet learned the Principles, I have thought good in a plaine and briefe manner, to teach alſo the other three former and more eaſie parts of Arithmeticke, viz. Numeration, Addition, and Subtraction, And firſt therefore of

Numeration.

The firſt thing that is to be learned by him that would begin to learne Arithmeticke, is to

know and to make the tenne figures, which be theſe 1. 2. 3. 4. 5. 6. 7. 8. 9. 0.

Whereof the laſt is called a Cipher, and is of it ſelfe nothing or naught, onely ſerving by ſupplying a place to increaſe the value of the other figures, which are alſo called Digits, and if the ſaid Cipher be joyned to any of them, thus, 90. it makes that figure or digit ten times ſo much as it was before the Cipher was ſet unto it, and that number is called an Article, ſo this 9 by putting too a Cipher thus, 90 is made ninety or nine times tenne, and is an Article. And theſe figures being taken in their owne proper value as they ſtand alone are to be read and taken thus

one two three foure five ſixe ſeven eight nine,

1 2 3 4 5 6 7 8 9

this is the ſeverall value of each of them while they ſtand ſingle and alone; Another valuation they have which they take from their ſcituation or places being ſome of them ſet together, and that is thus, When two, three, foure or more figures are ſet together, that figure which ſtandeth at that end of the row towards the right hand is ſaid to ſtand in the firſt place; and that firſt place doth ſignifie onely ſo much as the figure is in value, of it ſelfe, For thoſe figures that ſtand with it on that ſide of it towards the left hand give no increaſe of value unto it, though it gives increaſe of value unto them; The next

which

which is called the ſecond place, doth ſignifie ten times ſo much as the figure therein is of it ſelfe, the next called the third place betokeneth one hundred times ſo much as the figure in that place is of it ſelfe, and the fourth place betokeneth one thouſand times ſo much as the figure therein is of it ſelfe: the fift place tenne thouſand times ſo much, and ſo forth on this manner from place to place ſtretching infinitely.

In this number 46935. the five ſtandeth in the firſt place and therefore it is but five, the next being 3 ſtandeth in the ſecond place and is tenne times 3 that is thirty, the 9 ſtandeth in the third place, and is therefore nine hundred, the 6 ſtandeth in the fourth place, and is therefore ſixe thouſand, the 4 ſtandeth in the fift place and is therefore fourty thouſand, And the whole ſumme is to be read thus; fourty ſixe thouſand, nine hundred thirty five.

And for the more eaſe in reading or pronouncing any number conſiſting of divers figures or places, this order is to be obſerved.

Begin at that end of your number towards your right hand, and tell the figures or ciphers, ſaying one, two, three, there ſet downe a pricke, then begin at the ſaid pricke and tell on towards your left hand, ſaying againe one two three, and there ſet downe another pricke, and ſo goe forward in the ſame manner ſetting a pricke at the

end of every three figures thus 56879423, And in reading this or any ſumme, you muſt pronounce thoſe figures next to your left hand which are as it were parted from the reſt with the pricke, as if they were a number by themſelves, as here, you muſt reade this ſumme thus, fifty ſixe, but then becauſe you ſee two pricks, you muſt twice pronounce this word thouſand, ſaying, fifty ſixe thouſand thouſand, and then the next 3. figures from that pricke to the next, you muſt call eight hundred ſeventy nine, and becauſe you ſee there yet one pricke, you muſt once pronounce thouſand, ſaying, eight hundred ſeventy nine thouſand, And then the other three, ſeeing there is never an other pricke, are onely foure hundred twenty three. And this ſumme muſt be read together thus, Fifty ſixe thouſand thouſand, eight hundred ſeventy nine thouſand, foure hundred twenty three.

This ſumme 500090876̄03. muſt bee thus read; five hundred thouſand thouſand thouſand, nine thouſand thouſand, eighty ſeven thouſand, ſixe hundred and three.

If your number have in it more places, then there will be more pricks, and accordingly you muſt the ofter pronounce the word thouſand. So much for numeration, now of the ſecond part which is:

Addition

Addition.

ADdition is the adding or putting together of 2. 3. 4. or more ſummes or numbers, and bringing thē all into one totall ſumm, and is thus performed. If you would adde theſe two numbers 786094. and 539476. together, ſet thē thus, drawing a line under thē 786094 then ſay 6 & 4 is tenne, ſet downe the Cipher under the line beneath the ſaid 6 & 4 and carry the 1. in your mind to the next place, for you muſt know that 1 in that next place is as much as 10 in that firſt place, from whence you carry it; and the like order holds throughout all your places, Then ſay 1 in my mind and 7 is 8, 8 & 9 is 17 ſet downe the 7 under them beneath the line and carry the 1 in your mind to the next place, ſaying, 1 in my mind and 4 is 5, 5 & naught is 5, which 5 ſet downe in the next place beneath the line, then have you nothing in your minde, therefore ſay 9 and 6 is 15 ſet downe the 5 carry the 1 in minde, ſaying 1 in minde, and 3 is 4: 4 & 8 is 12, ſet downe 2 and carry one, ſaying 1 and 5 is 6: 6 and 7 is 13 that ſet wholly downe the 3 under the ſaid 5 and the 1 a place further, as you ſee performed in this addition, So theſe 2

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 786094
 539476
1325570
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numbers brought into one number doe make 1325570 as appeares, And this direction is ſufficient for the adding of any 2 numbers together, And the adding of more numbers together is done after the ſame manner, thus:

If you would adde together theſe 4 numbers

850723
490254
80978
30751
20221
1452706

place them thus drawing a line under them, or if you diſtruſt your memory you may draw 2 lines ſetting that downe alſo which you ſhould carry in your memory, betweene the two lines, then ſay 1 and 8 is 9, 9 & 4 is 13, 13 and 7 is 16, ſet downe the 6 under both the lines and the 1 betweene the lines in the next place, then ſay againe 1 and 5 is 6: 6 & 7 is 13: 13 and 5 is 18: 18 and 2 is 20, ſet downe the Cipher by the 6 under both the lines and the 2 in the next place betweene the lines, then begin againe with that 2 ſaying, 2 and 7 is 9: 9 and 9 is 18: 18 and 2 is 20: and 7 is 27, ſet the 7 under both the lines and the 2 betweene them, then ſay againe 2 and 4 naughts is 2, now bring downe that 2 below the lines; then ſay 3 and 8 is 11: 11 and 9 is 20 and 5 is 25 ſet the 5 under the lines and the 2 betweene them, then ſay 2 and 4 is 6: 6 and 8 is 14 which ſet downe under the lines, ſo it appeares that the totall of theſe 4 ſummes is 1452706, the figures betweene the lines are

now

now of no uſe for they ſerved onely to eaſe your memory.

For proofe of this kind of addition (when you have learned ſubtraction) doe thus, adde together 3 of theſe ſummes and ſubſtract that totall from this totall, if the remainder be juſt your fourth ſum then is the addition true or elſe not.

Or you may prove it by caſting away 9 as oft as you can out of the particular ſummes and note the remainder, then in like manner caſt away 9 as oft as you can out of the totall, then if you find that remainder to agree juſt with the other remainder thē it is like to be true, or elſe it is falſe:

The proofe is made in this manner. I take the firſt addition here made, which being finiſhed 786094
ſtood thus. 539476 So beginning with the up-
is 15 caſt 1325570 permoſt ſumme I ſay 7 & 8
away 9 &
there reſteth 6: 6 and 6 is 12, caſt away 9 and there reſteth 3: 3 and 4 is 7: 7 and 5 in the next ſumme is 12 caſt away 9 reſteth 3: 3 and 3 is 6: 6 and 4 is 10 caſt away 9 reſteth 1: 1 and 7 is 8: 8 and 6 is 14 caſt away 9 reſteth 5 that 5 I ſet downe at the end of a line thus 5---. then I begin with the totall ſaying 1 & 3 is 4: 4 and 2 is 6: 6 and 5 is 11 caſt away 9 there reſteth 2: 2 and 5 is 7: 7 and 7 is 14 caſt away 9 reſteth 5 which I ſet at the other end of

the line 5---5, ſo this addition doth appeare to be true.

So much for the addition of numbers, and now I will ſhew you the manner of adding together pounds, ſhillings, and pence; which is thus,

If you would adde together theſe ſummes of mony; When you have thus placed them, begin with the pence (and till you grow expert to goe on to 24. 36. 48. and 60.) you may ſet downe a pricke as oft as you come to 1s. So then ſaying 4 and 6 is 10; 10 and 8 is 18 ſet downe a pricke and there reſteth ſixe: 6 and 7 is 13 ſet downe a pricke and there reſteth 1: 1 and 9 is 10, which 10 ſet downe under the pence beneath the line; Then for the two pricks carry 2 with you to the ſhillings ſaying 2 and 3 is 5: 5 and 9 is 14: 14 and 9 is 23: 23 and 4 is 27: 27 and 7 is 34, ſet downe the 4 under the ſhillings, and for the 3 reckon that with the tennes which you have not yet added, ſaying, 3 and one is 4 and 1 is 5 and 1 is 6 which 6 you muſt underſtand is 60s. that is 3l. therefore ſeeing there is never an odde tenne to ſet with the 4 you may ſet a Cipher by it onely for faſhion ſake and carry 3 to the pounds, ſaying 3 and 8 is 11: 11 and 7 is 18; 18 and 6 is 24; 24 and 3 is 27:

	l.	s.	d.
	346.	17.	9
	293.	14.	7.
	156.	19.	8.
	97.	9.	6
	78.	3.	4
	973.	04.	10.

27: 27 and 6 is 33. ſet down 3 under the line and carrie 3 to the next place, ſaying; 3 and 7 is 10: 10 and 9 is 19: 19 and 5 is 24: 24 and 9 is 33: 33 and 4 is 37. ſet downe 7 carry 3, ſaying, 3 and 1 is 4: 4 and 2 is 6; 6 and 3 is 9 which 9 ſet down under the line, ſo is the addition ended, and thoſe 5 ſummes brought into one totall do make 973l. 4s. 10d. as appeares. So much for addition, now of the third part of Arithmeticke, which is

Subtraction.

SVbtraction, is to take one or more leſſer ſummes out of a greater ſumm or number and to ſhew what the remainder is, and ſo ſhewes juſtly what is the difference betweene one number and another; and is thus performed. If you would ſubtract 57083 from 73406 place them thus. Then ſay 3 out of 6 there reſteth 3 which you muſt ſet under the line; then ſay 8 out of 0 that cannot bee but 8 out of 10 reſteth 2 which 2 alſo ſet downe under the line, then ſay 1 which I borrowed of the 4 in the upper number which made the Cipher 10, being put to the Cipher under the ſaid 4 makes 1 which 1 taken from the ſaid 4 there reſteth 3 to ſet downe under the line, then ſay 7 out of 13 reſteth 6 to ſet under

73406	
57083	
16323	

under the line; then ſay 1 that I borrowed and 5 which is 6 which 6 out of 7 reſteth 1 which being ſet downe under the line the worke is ended, and the remainder appeares to be 16323. the proofe of this worke is made by adding together the ſaid remainder and the leſſer number if they make juſt the greater number then is the worke true, which may alſo be proved by caſting all the nines out of the remainder and out of the leſſer number, and note that remainder, and then likewiſe to caſt away all the nines out of the greater number and if that remainder agree with the other then it is like to be true or elſe it is falſe.

And if you would ſubſtract theſe 3 ſums from this one ſumme place the reſt under it thus

Then ſay 1 and 2 is 3: 3 and 6 is 9: 9 out of 17 and there reſteth 8 to ſet under the line, then ſay 1 that I borrowed and 4 is 5: 5 and 3 is 8: 8 and 5 is 13: 13 out of 13 there reſteth 0 to ſet under the line, then ſay 1 that I borrowed and 7 is 8: 8 and 5 is 13: 13 and 8 is 21: 21 out of 29 reſteth 8 to ſet downe, then ſay 2 that I borrowed and 3 is 5: 5 and 4 is 9: 9 and 9 is 18: 18 out of 24 reſteth 6 to ſet downe, ſo is the worke finiſhed and the

	24937	9856
	9856	4532
	4532	3741
	3741	
	6808	

the remainder is 6808 as appeares. And thus much may ſuffice for ſubtraction, now of the next part of Arithmeticke, which is,

Multiplication.

MVltiplication is a kinde of ſpeedie addition whereby working with 2 numbers the ſame totall is produced which would ariſe by the Addition of many ſummes or rather of one ſumme many times, for otherwiſe it holdeth not, and therefore doth not put addition out of office,

The worke (according to the ordinary forme which I will firſt ſhew,) is thus wrought, If you would multiply this number 5836. by 254. ſet the greater number called the Multiplicand uppermoſt, and under it towards the right hand ſet your leſſer number called the Multiplyer, then you muſt Multiply every figure in your Multiplicand by every figure in your Multiplyer one after another and ſet the product ariſing thereby under a line beneath both the numbers in this manner then begin ſaying 4 times 6 is 24 ſet downe the 4 under the line and for the 20 carry 2 in your mind to the next place ſaying 4 times 3 is 12

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 5836
  254
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23344
29180
11672
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1482344
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and

and 2 in my minde is 14. ſet downe the 4, carry 1, ſaying, 4 times 8 is 32 and 1 in minde is 33, ſet downe 3 carry 3, ſaying, 4 times 5 is 20, and 3 in mind is 23; that ſet fully downe and ſtrike a ſmall daſh through your 4 to ſhew that you have done with it, Then begin with the next figure, ſaying, 5 times 6 is 30, ſet downe the Cipher under the ſaid 5 and carry 3 to the next place, ſaying, 5 times 3 is 15 and 3 in minde is 18, ſet downe 8 carry 1, ſaying, 5 times 8 is 40 and 1 in mind is 41, ſet downe 1 carry 4, ſaying, 5 times 5 is 25 and 4 in minde is 29 that ſet fully downe and give your 5 a daſh alſo; Then ſay againe 2 times 6 is 12; ſet the 2 under the ſaid 2 in your Multiplyer and carry 1, ſaying, 2 times 3 is 6 and 1 in minde is, 7 which ſet downe in the next place by the 2, then ſay, twice 8 is 16, ſet downe 6 carry 1, ſaying, twiſe 5 is 10 and 1 in minde is 11, which ſet downe at full, then draw a line under thoſe 3 numbers which are produced by your Multiplication, adding them together and ſetting the totall under the line, which totall is the juſt product of 5836 multiplyed by 254. as appeares,

The proofe is thus made, caſt away all the nines out of your multiplyer ſetting downe the remainder at the end of a line, then likewiſe caſt all the nines out of your multiplicand, ſetting the remainder at the other end of the ſaid line,

line, then multiply thoſe 2 remainders one by another, caſting away the nines if any ariſe, ſetting the remainder over the ſaid line, then caſt all the nines out of your product, ſetting the remainder under the foreſaid line, if then the 2 figures that ſtand over and under the ſaid line doe agree, then is the multiplication like to be true, if not, then you have failed either in multiplying, or in adding together your ſeverall products. And this proofe ſerveth alſo for my kind of multiplication, which is much more eaſie; the manner whereof followeth.

But thus much I deſire of all them that are deſirous to learne to performe Multiplication and Diviſion onely by Addition and Subtraction; namely, that they bee firſt skilfull and readie in Addition and Subtraction, and alſo in doubling, tripling, and redoubling a number, and in halving or parting a number in the middle, and thirding a number, all which is very eaſie, and yet this is all that I require,

And he that is but readie in theſe (by my eaſie Rules inſuing) ſhall be able to performe multiplication, with little trouble, and diviſion with leſſe, which being the hardeſt of all the five parts of Arithmeticke, is by my way made ſo eaſie, that it may bee performed not onely with eaſe but even with pleaſure, And now firſt for this kind of multiplication, and therein firſt for the

multi-

multiplying of any number by any one figure or digit according to my obſervations, which that it may be the better borne in minde, I have put the Rule in verſe, which is as followeth.

If you deſire to multiply by two,
Your doubled ſumme alone the ſame doth do,
Tripple your ſome to multiply by three,
By foure, your number muſt redoubled be,
By five, take halfe your ſingle ſumme, and then
Put to a Cipher, as is uſ'd by tenne,
But odde ſummes part not juſt, in ſuch a caſe
The figure 5 muſt take the Ciphers place,
Your ſingle ſumme unto fives product adde,
And ſo the product made by ſixe is had,
Fives product & your doubled ſumm doth make
The product ſeven affoords without miſtake,
Put to your ſingle ſumme a Cipher, ſo
Tis quickly multiplyed by tenne you know,
From wch ſubtract your doubled ſumm, & ſtraight
You have the product which is made by eight,
Or take your ſingle ſumme thence, if you pleaſe,
To have nines product, all is done with eaſe:

This will be very neceſſarie to be remembred, and eſpecially my manner of multiplying by the figures 5 and 9, for they doe affoord much helpe in my way of multiplication, as will appeare in the worke inſuing.

And

And now for my plaine way of performing multiplication onely by addition, the rule is this; When two numbers are to be multiplyed together, ſet downe firſt your multiplicand and after it your multiplyer, ſetting a ſtop or pricke betweene them, as in the examples following, Then double, triple, and redouble your multiplicand, which is done by doubling it, then adding thoſe two numbers together, and then againe adding that third and the firſt number together, all which is very eaſily done, And then you ſhall bee ſure that either ſome one or ſome two of thoſe foure numbers, or the third tripled, will anſwer to any figure that can bee in your multiplyer, which being accordingly drawne out and added together, finiſheth the worke.

Example	59364 by	7583
	118728	415548
	178092	296820
proofe	237456	474912
		178092
	product	4501572 12

8579364	3697
17158728	25738092
25738092	51476184
34317456	77214276
	60055548
product	31717908708

Here you ſee for the figure 3, I take my third number, for 6 I take the ſame doubled, for 9 I take it tripled, and for 7 I take my third and fourth numbers added together, every number (placed for addition) gaining a place towards the right hand of that above it, which muſt bee well obſerved, and then adding thoſe numbers together, I have the true product, which with more difficulty would have beene found the other ordinary way, And here you ſee all the hardneſſe that is in performing multiplication this way, which is none at all, but onely an heedfull performance of addition: Here is no need to multiply every figure in one of the numbers by every figure in the other, nor to charge the memory with carrying numbers from one place to another, which, whilſt a body is multiplying another figure, is apt to ſlip out of mind, and is oftentimes cauſe of much errour.

And now having ſhewed the hardeſt and worſt of this way, I will ſhew you how (in many

many works) you may doe it yet more readily, if you pleaſe to take ſuch advantages; as in this laſt example, it may very well be done without removing the numbers for addition, Thus,

8579364 . 3697

17158728

25738092

51476184

77214276

60055548

product 31717908708

Here you may obſerve as ſoone as I come to the number anſwering to the figure 3, I double that number, ſo have I that which anſwereth to the figure 6, and adding thoſe two together, I have that which anſwereth to 9, then adding that which anſwereth to 6 and the firſt together, I have that which anſwereth to 7; and then excluding the two higheſt with a line, and adding the other 4 numbers together, not directly, but byas wiſe, beginning at the loweſt corner towards the right hand, and ending at the higheſt corner towards the left hand (which is very eaſie to doe, if the figures be rightly placed,) I have the true product as appeares. This advantage to doe the worke without removing the numbers, will fall very oft; And ſometimes you may begin your addition at the upper corner towards

the right hand, and end at the lower corner towards the left, as ſome examples following doe ſhew.

59786 . 2648	59786 . 8462
119572	119572
358716	358716
239144	239144
478288	478288
158313328	505909132

8349 . 3096	6579 . 2475
25047	13158
00000	26316
75141	46053
50094	32895
25848504	16283025

In this laſt example I left a ſpace for the figure 7, till I had found for the figure 5. which ſpace I after eaſily ſupplied by the addition of 5 and 2.

7829 . 742	6297 . 358
15658	18891
31316	31485
54803	50376
5809118	2254326

3987 . 389
11961 . 983
31896
35883
1550943 product by 389
3919221 product by 983

In this example I left a ſpace for 8 till I had found for 9, which I after ſupplied by taking one from 9.

9837 . 2467
19674 . 7642
39348
59022
68859
24267879 product by 2467
75174354 product by 7642

But if this preparation bee thought tedious, and that the worke will not well admit of my inſuing abridgements, yet to make it more eaſie then the ordinary way, doe thus. Double your multiplicand (which is inſtantly done) ſo may you very eaſily performe the worke, and yet never doe more then double, triple, and redouble,

which cannot yeeld above 4 to carrie in minde. Examples.

43967 . 657

87934
263802
219835
307769
28886319:

57936 . 2984

115872
521424
463488
231744
172881024

3798 . 679

7596
44388
51786
66582
5023242

976483 . 7468

1952966
6835381
3905932
5858898
7811864
7292375044

795843 . 65943

15931686
47795058
39829215
7169587
3186372
23897529
52529158949

So much for the performing of Multiplication onely by addition, or (at the most) by addition with the helpe of doubling, tripling and redoubling, which I doubt not will bee found much more easie (especially for learners) then the ordinary way. And now for my abreviations

ons or abridgements: For my owne part I was never taught any other abreviation, but onely in multiplying by 10. 100. 1000, &c. which is done by putting to your number one Cipher for 10. 2 Ciphers for 100, and 3 for 1000, &c. But I will ſhew you divers other Abridgements, helps and advantages to bee taken in the performing of many multiplications: And for as much as I have already given a Rule for multiplying by the figures 5 and 9, from whence (for the moſt part) my obſervations touching theſe helps and abridgements are raiſed, I will therefore (for brevity) onely ſet downe the examples, preſuming that the diligent Reader will readily conceive the manner of worke.

78936 by 5
294680 product

84379 by 50
4218950 product

75638 by 15
378190
1134570 product

81756 by 25
408780
2043900 product:

or thus 97635 by 5:
488175 product

749629 by 500
374814500 product

87046 by 51
435230
4439346 product

73467 by 52
367335
3820284 product

84972

84972 by 75
424860
6372900 product

75869 by 55:
379345
4171795 product

46738 by 48
2336900
2243424 prod:

67587 by 480
337935 .
32441760 prod:

32918 by 499
164590..
16426082 prod:

76589 by 497
382945..
38064733 prod;

87514 by 495
437670..
43329330 prod:

65738 by 489
328690..
32145882 prod:

63945 by 57
319725
3644865 product

89436 by 65
447180
5813340 product

39784 by 49
1989200
1949416 product

58943 by 490
294715 .
28882070 product

59436 by 498
297180..
29599128 prod:

63475 by 496
317375..
31483600 prod:

83467 by 494
417335..
41232698 prod:

87392 by 488
436960..
42647296 prod:

49735 by 487
248675..
24220945 prod:
68713 by 485
343565..
33325805 product
83247 by 478
416235..
39792066 prod:
68794 : by 465
343970..
31989210 prod.
83629 by 198
167258..
16558542 prod:
94637 by 396
378548..
37476252 prod:
67324 by 594
403944..
39900456 prod:
67328 by 792
538624..
53323776 prod:

38254 by 486
191270..
18591444 product
45973 by 479
229865..
22021067 prod:
74386 by 475
371930..
35333350 prod:
876945 by 3597
2630835
5261670..
3154371165 prod:
58673 by 297
176010..
17425881 prod:
83657 . 495
418285..
41410215 prod:
95234 by 693
666638..
65997162 prod:
85732 by 891
771588..
76387212 prod:

63847 by 197
127694..
12577859 product

97326 by 295
291978...
28808496 prod.

83276 by 395
333104..
32894020 prod.

73925 by 494
369625..
36518950 prod.

And ſo after this manner to 791.

87593 by 287
262779..
25139191 product

92374 by 386
369496..
35656364 prod.

And ſo ſucceſſively to 782

69453 by 277
208359..
19238481 prod.

58975 by 376
235900..
22174600 prod.

And ſo ſucceſſively to 871

87694 by 4989
438470...
437505366 prod.

56947 by 4288
284735...
284051636 prod.

91735 by 4987
458675....
457482445 prod.

89567 by 4986
447835...
446581062 prod.

37869 by 4985
189345.....
188776965 prod.

74695 by 4984
373475...
372279880 prod.

49876

49876 by 4982
149628
249385...
248487227 prod.

59876 by 1499
299380
898140..
89754124 prod.

37896 . 4981
151584
189480...
188759976 prod.

986437 by 1498
4932185
14796555..
1477682626 prod.

Or if you would obſcure from the beholder, the manner how this worke is done, you may doe it Thus,

49756 by 1497
248780
746340
74484732 product

57983 by 1495
289915
869745
86684585 prod.

47398 by 1488
236990
710970..
70528224 prod.

76849 by 1496
384245
1152735
114966104 prod.

87549 by 1494
437745
1313235..
130798206 prod.

82567 by 1485
412835
1238505..
122611995 prod.

75698 by 2499
378490
1892450..
189169302 prod.

58796 by 2497
293980
1469900..
146813612 prod.

823578 by 5643
4117890
46943946..
4647450654 prod.

3879465 by 6534 :
23276790
256244690..
25368224310 prod.

549783 by 6138
418481 .
5284376..
523153224 prod.

78346 by 2498
391730
1958650..
195708308 prod.

793457 by 3465
3967285
27770995..
2749328505 prod.

6589735 by 4356
26358940
289948340..
28704885660

5783967 by 8316
46271736
4858532228..
48099469572 prod.

7598464 by 1386
30393856
106378496..
10531471104 prod.

In these last examples, the placing of the figures in the multiplyer, is to be observed; And if the figures in the multiplicand fall out to bee rightly sorted, then the worke may be performed

med with good advantage, Thus.

475695243 by 74963
524741
374815
524741
356598991
356595425501009 prod.

342596574 by 593824
2375296
1187648
3562944
2034441024
203442067959 76 prod.

The ſame example wrought my plaine way by addition, Thus.

342596574 by 593824
1712982870
3083369166
1027789722
2740772592
0685193148
1373086296
10344206795897 6 product.

Here I firſt multiply by 5, my eaſie way; then by 9, by way of ſubtraction, then I triple my number, then I adde 5 and 3 together, then I double my number: Laſtly, I double againe the

ſaid

ſaid doubled number; And then the addition of thoſe 6 numbers, brings out the product as appeares. This way is plaine, eaſie, and univerſall, whereas theſe abridgements are more reſtrain'd and limited, yet very good uſe may be made of them, ſeeing ſuch kinde of advantages in worke, may often times be taken, for they may be extended much further then I have yet, or doe intend here to ſet downe, yet a few more ſhall here follow, and ſo I will leave the inlarging of this buſineſſe to the Readers diſcretion, as occaſion ſhall be offered.

578694 by 2396
2314776
13888656 ..
1386550824 product

9637854 by 32495 :
19275608
48189270
313330150 ..
3132819650 product

8574639 by 45297
42873195
25723917
388431467 ..
388405422783 prod.

6947385 by 53695
20842155
34731695
371684524 5 ..
371663682345 prod.

In the firſt, and in the laſt of theſe examples, the ſecond number is ſubtracted, in the other two, the third is ſubtracted, which kinde of advantage may be often times taken.

Certaine

Certaine examples of multiplication abreviated, where the product is set downe at once.

7494 8 by 99	874967 by 999
741985 2 . product	874092033 . prod.
69432 by 98	94578 by 998
6804336 prod.	94388844 . prod.
49876 by 97	59786 by 997
4837972 . prod.	59606642 . prod.
37869 by 989	92568 by 988
37452441 . prod.	91457184 prod.
85763 by 987	74695 by 986
84648281 . prod.	73649270 . prod.
67945 by 979	57486 by 978
67497155 . prod.	56221308 . prod.
738469 by 9987	596837 by 9978
7375089903 . prod.	5955139586 . prod.
684359 by 9876	579463 by 9867
67587 29484 prod.	571756142 1 . prod.

Alſo you may eaſily multiply by 5 ſundrie figures, and yet ſet downe but onely one ranke of figures more then the product, Thus.

5864739 by 23976	8497534 by 24975
140753736	212538350
140612982264 prod.	212325811650 prod.

And ſo much for Multiplication.

Now

Now of the next and fift part of Arithmetick, which is *Diviſion.*

DIviſion, hath the like relation to Multiplication, that Subtraction hath to Addition; Addition puts one ſumme to another; like a thriftie Father; Subtraction takes one ſumme from another, like a waſtfull ſonne: ſo Multiplication makes a number many times more then it was, Diviſion makes it many times leſſe then it was; and I may ſay, Diviſion is to multiplication, like a bad wife to her huſband, able to undoe it. For when you have multiplyed one number by another, if you turne your Multiplyer into a Diviſor, and thereby divide the Product of your Multiplication, you ſhal find in your Quotient that mounting ſumme falne juſt to his firſt valew, that worke being undone by this.

That number which in Multiplication is called the Multiplicand, is in Diviſion, called the dividend; that which is there called the Multiplyer, is here called the Diviſor, and that which is there called the Product, is here called the Quotient: but

but in Diviſion, there uſeth for the moſt part to be another number which is improperly called the Remainder, but is indeed part of the Quotient, as if I divide 12 by 5, the Quotient is improperly ſaid to be 2, and the Remainder 2. but indeed the Quotient is $2\frac{2}{5}$ that is 2 & 2 fifts, and ſo there is no Remainder. In teaching Diviſion (as I have done in Multiplication) I will firſt ſhew the manner how to performe it after the ordinarie way, which is thus.

When one number is to bee divided by another, you muſt place your leſſer number called your Diviſor, under your greater number called the Dividend, not at that end towards the right hand as in Multiplication; but at the other end, as if I would divide 56987 by 79, I place them thus 56987, where you ſee I am faine to looſe
79 a place towards the left hand, becauſe the 2 figures in the Diviſor are greater then the 2 firſt writ figures in the dividend, which elſe I ſhould not doe; then I begin, ſaying, How many times 7 can I have in 56. I finde I could have it 8 times, but that would quite conſume it, ſo that I ſhould have but 9 to take 8 times 9 out of, which cannot be, therefore I take it but 7 times, ſaying 7 times 7 is 49. 49 out of 56 there reſteth 7: then having placed 7 in my quotient, and likewiſe the 7 that remaines being ſet over the

the 6, and the 56 and the 7 below being cancelled, the numbers ſtand thus:

```
  7
 56987
 79    (7
```

Then I ſay 7 times 9 is 63. 63 out of 79 there reſteth 16, which being placed over the ſaid 79, and the ſaid 79 and the 9 below, being cancelled, they ſtand thus:

```
  1
 76
 56987 (7
 79
```

Then I remoove my Diviſor one place forward ſo the 7 ſtandeth under 16, wherein it may be had twice: therefore I ſet 2 in my Quotient, and taking twice 7 which is 14 out of 16, there reſteth 2, which I ſet over the ſaid 6, cancelling the ſaid 16 and the 7 below, then I ſay twice 9 is 18, which tooke out of 28, reſteth 10, which I ſet over 28, cancelling both it and the 9 below, and then the numbers ſtand thus:

```
  11
  72
  60
 56987 (72
 799
  7
```

Then I ſet forward my Diviſor: ſo there is 10 over the 7, wherein I can finde the ſaid 7 but once, therefore I ſet 1 in my Quotient, and then ſay once 7 out of 10 reſteth 3, which being placed over the Cipher, I cancell the ſaid 10 and likewiſe the 7 below, then I ſay, once 9 out of 37 reſteth 28, which I ſet above the ſaid 37, cancelling it and the 9 below, then is the worke

finiſhed,

finished, and standeth thus:

```
  12
 123
7608
56987  (721
7599
 77
```

Where the Quotient appeares to be 721, and the Remainder 28, or rather the Quotient is $721\frac{28}{79}$ and no Remainder. The proof is made by casting al the nines out of the Divisor, and to set the Remainder at the end of a line; then to cast all the nines out of the Quotient, and set that Remainder at the other end of the line, then to multiply those two Remainders together, casting away the nines if any arise, and to that Remainder, put the Remainder of the Division, and casting away all the nines from thence, that Remainder is to bee set over the line, then all the nines must likewise be cast out of the Dividend, and that Remainder set under the line, thē if the 2 figures that stand over & under the said line be alike, the Division is like to be true, or else it is false; so in this exāple, the 9 being cast out of the Divisor, there resteth 7 to set at one end of the line, then casting 9 out of the Quotient, there resteth 1 to set at the other end, then I say once 7 is 7 which with the 2. and the 8 that are in the Remainder, makes 17, from whence I cast 9 and there resteth 8. that I set over the line, then I cast all the nines out of the Dividend, and finde there resteth also 8, which I set under the line, and so the worke

appeares to be true: this is a briefe proofe ſeldome failing, but the ſureſt triall is made by multiplication, and this proofe ſerves alſo for my other forme of Diviſion, which is as followeth. In Diviſion, there is the like preparation to bee made, as in Multiplication, ſave that now you are ſtill to prepare the leſſer number, which is your diviſor; nor can you prepare it to the figures which will be in your quotient, becauſe the preparation is to be made before the Quotient is knowne; Therefore prepare your diviſor to the figure 5 thus,

Now you may perceive that if you would place your Diviſor under your Dividend, after the ordinarie way, it muſt loſe a place, becauſe 76 cannot be had in 57, therefore it followes that 578 is the number from which you muſt firſt ſubtract your Diviſor, therefore you muſt looke amongſt your prepared numbers, where you ſhall find that either ſome one or ſome two of them will come ſo neer the ſaid 578, as to point you out your quotient figure, which you may preſently perceive to be your third and fourth numbers, which make 532, this you may conclude to be your number, which you muſt ſubtract from the ſaid 578, for if you ſhould take your fourth number doubled, that makes 608, which is more then 578, which it muſt not be: ſo then

5789 . 76. (
152
228
304
380

then, becauſe 3 and 4, anſwering to your third and fourth numbers, doe make 7, you muſt ſet 7 in your Quotient, and ſet 532 under 578, to be ſubtracted from it, thus.

5789	. 76 .	(7
532	152	
469	228	
	304	
	380	

So yeu may ſee this ſubtraction being made the number from which you muſt next ſubtract, is that which is ſaine below the line, viz. 469, whereunto you may quickly ſee that either your third number doubled, or your firſt & fift numbers which is all one, will come ſo neere, as to point you out 6 for your next Quotient figure, and the number to ſubtract will be 456. which being taken from 469 there reſteth 13. which is the remainder of this Diviſion, and the work being done ſtandeth thus.

By this example you may ſee with what eaſe & certainty this way doth performe Diviſion, for whatſoever your nubers be, there may bee more ſubtractions, but there is no more hardnes in the work then is in this example: you ſee you need not this way ſay how many times 7 can I have in 57, & afterwards

5789	. 76	
532	152	
469	228	*Proofe.*
456	304	2
13	380	4——4
	(76 13/76	2

wards, how many times 7 can I have in 46, nor need you multiplie every figure in your Diviſor, by every figure in your Quotient, nor need you carry numbers in your mind from one place to another, nor place the remainder of your ſubtraction over your dividend, nor need you begin your ſubtraction (as it were) at the wrong end, nor neede you cancell or daſh out any figure, which in ſome works (without great care) doth cauſe a confuſion.

And foraſmuch as the eaſineſſe of this worke after this way is ſuch, that few directions will ſerve for the teaching of it, I think that which is already taught, together with theſe examples enſuing, is ſufficient: Therefore obſerve well theſe examples, for you may plainly ſee from one ſubtraction to another, the manner how the ſame are performed.

4972356 1	8734
43670	17468
60535	26202
52404	34936
81316	43670
78606	(5693 · $\frac{899}{8734}$
27101	
26202	1
899	4 — 5
	1

Here

Here you may eaſily obſerve, that having quickly prepared my Diviſor till I have 5 numbers, I find that my fift number is it that muſt be firſt ſubtracted, therefore ſetting 5 in my Quotient, and placing my ſaid fift number under my Dividend, and ſubtracting the ſame from the five figures thar ſtand over it, the Remainder is 6053, which I place under the line, drawing downe thereunto the next figure in my Dividend, which is 5, and then the number is 60535: then looking among my prepared numbers, I quickly ſee there is no one among them that is fit for this ſubtraction: then looking at my third and fourth numbers, I quickly perceive they would be ſomething too much, therefore I conclude that my third number doubled, is it that will doe it; I therefore ſet 6 in my Quotient, and ſubtract my ſaid third number doubled, being 52404 from 60535, and the Remainder is 8131, whereunto I draw downe my next figure, which is 6, and then it is 81316; then, I look among my prepared numbers, where it is moſt eaſie to bee diſcerned, that my fourth and fitt numbers together, will performe this ſubtraction; therefore ſetting 9 in my Quotient, and bringing thoſe two numbers into one, they make 78606, which I ſubtract from 81316, and there reſteth 2710, whereunto I draw downe my next and laſt figure, which is 1, and then it is 27101, from

whence I ſee my third number muſt be ſubtracted; which being done, and 3 ſet in my Quotient, the worke is ended, the Quotient appearing to be 5693, and the remainder 899. And howſoever this relation in making the buſineſſe ſo plaine, may ſeeme ſomewhat tedious, yet indeed the diviſion is performed moſt eaſily and moſt certainly: it muſt be through great negligence if any error be this way committed, whereas great care and heed is required to avoid errors the other ordinarie way.

But this is one note to be obſerved, you doe underſtand that after every ſubtraction, you muſt draw downe the next figure in your Dividend, but if after the drawing downe of your next figure, you cannot have your Diviſor in that number, then you muſt ſet a cipher in your Quotient, and draw downe another figure; if yet you cannot have your Diviſor once in that number, then you muſt ſet another cipher in your Quotient, and draw downe another figure if there be any more in your Dividend, if not, the worke is ended, as appears by theſe examples.

30569943	· 849	
2547	1698	
5099	2547	
5094	3396	
5943	4245	
5943	(36007	
0000		

Another example.

426649	· 79	
395	158	
316	237	
316	316	
049	395	49
	(5400	79

123456789	· 98765	(1250 539
98765	197530	
246917	296295	
197530	395060	
493878	493825	
493825		
539		

It will be good (ſeeing it may be quickly done) to prove whether your Diviſor be truely prepared by caſting out the nines, and multiplying the Remainder by 5, then alſo caſting the nines out of your fift number, and then if thoſe 2 figures agree, after the nines are caſt out, it is like to be truly prepared, or elſe it is not, and then you would loſe your labour in ſubtracting.

And now reſteth only to ſhew you how to abreviate ſome diviſions. To divide a number by 10, is ordinarily done, by ſtriking off the figure in the firſt place, which is that next the right hand, thus, 369(7, ſo the quotient is $369\frac{7}{10}$. by 100, thus 576(92. where the quotient is $576\frac{92}{100}$. &c. To divide by 20, is uſually done by ſtriking off the ſaid laſt writ figure, and then halving the reſt, thus. $\frac{436}{218}$(^{2} where the Quotient is $218\frac{2}{20}$.

Theſe are all the abridgements of Diviſion that I was ever taught; And now I will from mine owne obſervation briefly ſet downe ſome other abridgements and varieties of Diviſion, which I doubt not will be found very uſeful and convenient, in many things where ſuch advantage may bee taken, giving a quick and pleaſing diſpatch to ſuch works as (the ordinary way) would be both tedious and troubleſome: But ſeeing my deſire is to contract this treatiſe into as ſmall a volume as may be, I will therefore only ſet downe the examples as plainly as I can, hoping

hoping the induſtrious Reader will thereby conceive the manner how they are wrought, without further Rules. And firſt, for the figure 5, as in multiplication, ſo in Diviſion, it will afford much advantage. To divide any number by 5 is but thus. 854693 · 5

Quotient: $170938\frac{3}{5}$

By 15 thus, 795362 · 15
159072
Quotient: $53024\frac{2}{15}$

If any thing remain in thirding, each Unite is $\frac{1}{15}$.

By 25 thus, 659734 · 25
131946
Quotient: $26389\frac{9}{25}$

or thus, 6597 | 34.25
quotient 26389 | $\frac{09}{25}$

By 35 thus, 475639 · 35
$6794\frac{8}{7}$
Quotient: $135.89\frac{24}{35}$

By 45 thus, 3947634 · 45
789526
$263175\frac{9}{15}$
Quotient: $87725\frac{9}{45}$

By 50 thus, 2897456 · 50
Quotient: $57949\frac{6}{50}$

By

By 500 thus, 7630987 . 500
Quotient: 15261 $\frac{487}{1000}$

By 11 thus, 8257069 . 11
Quotient: 750642 $\frac{7}{11}$

By 22 thus, 6097149 . 22
554286 $\frac{3}{11}$
Quotient: 277143 $\frac{3}{22}$

By 33 thus: 7251968 . 33
659269 $\frac{2}{11}$
Quotient: 219756 $\frac{20}{33}$

By 44 thus, 5796839 . 44
526985 $\frac{4}{11}$
263492 $\frac{15}{22}$
Quotient: 131746 $\frac{15}{44}$

By 55 thus, 2467939 . 55
224358 $\frac{1}{11}$
Quotient: 44871 $\frac{34}{55}$

By 66 thus, 2796834 . 66
254257 $\frac{7}{11}$
84752 $\frac{18}{33}$
Quotient: 42376 $\frac{18}{66}$

By

By 77 thus, 4596347 . 77
417849 $\frac{8}{11}$
Quotient: 59692 $\frac{61}{77}$

By 75 thus, 69734 | 85 . 75
23244 | 50
Quotient: 92979 | 60

By 88 thus, 3579208 . 88
325382 $\frac{6}{11}$
81345 $\frac{22}{44}$
Quotient: 40672 $\frac{72}{88}$

Now followeth Diviſion abreviated by the help of Addition, wherein you ſhall find the figures 9, and 5 as uſefull, as in abreviating Multiplication by the help of Subtraction.

By 9 thus, 6785 . 9
683
71
Quotient: 753 : 8

By 99 thus, 289475 . 99
2969
Quotient: 2923:98

By

By 999 thus, 6974583 . 999
7557

Quotient: 6981:564

By 9999 thus, 5807691 . 9999
Quotient: 580:8271

By 98 thus, 285739 . 98
5753
167

Quotient: 2915:69

By 998 thus, 8597632 . 998
17826

Quotient: 8614:860

By 9998 thus, 8328557 . 9998
10221

Quotient: 833:223

By 97 thus, 856743 . 97
25744
815

Quotient: 8832:39

By

By 997 thus, 574938 · 997
2660

Quotient: 576:666

By 96 thus, 487693 · 96
19597
877
109

Quotient: 5080:13

By 996 thus, 3589674 · 996
15030

Quotient: 3604:90

By 95 thus, 1970538 · 95
98563
4988
333

Quotient: 20742.48

By 995 thus, 95463782 · 995
478097
2487

Quotient: 95943:497

By

By 94 thus, 729465 . 94
43829
2657
213

Quotient: 7760:25

By 994 thus, 3574968 . 994
22412

Quotient 3596:544

By 9994 thus, 5216439 . 9994
Quotient: 521:9565

By 93 thus, 497935 . 93
32788
2377
238

Quotient: 5031:52

By 993 thus, 8476935 . 993
60267

Quotient: 8536:687

By

By 92 thus, 629345 . 92
50389
4113
341

Quotient: 6840:65

By 992 thus, 6497315 . 992
52291

Quotient: 6549:707

By 91 thus, 358794 . 91
32377
2984
345

Quotient: 3942:72

By 991 thus, 2785968 . 991
26033

Quotient: 2811:267

By 989 thus, 3946078 . 989
43484

Quotient: 3989:957

By

By 988 thus; 1946735 . 988
24087

Quotient: 1970:375

By 987 thus, 5716948 . 987
75256
1231

Quotient: 5792:244

By 986 thus, 5296728 . 986
74872
1908

Quotient: 5371:922

By 985 thus, 6079683 . 985
91868
2233

Quotient: 6172:263

By 984 thus, 8472987 . 984
136539
2715

Quotient: 8610:747

By

By 983 thus, 9645738 . 983
164703
3491

Quotient: 9812:542

By 982 thus, 4596384 . 982
83112
1606

Quotient: 4680:624

By 981 thus, 3597846 . 981
69189
1500

Quotient: 3667:519

By 499 thus, 7389486 . 499
14778 15264
30

Quotient: 14808 : 294

By 498 thus, 8497635 . 498
16995 34125
68

Quotient: 17063 : 261

By 497 thus, 968379 . 497
1936 6187
12

Quotient: 1948:223

By 496 thus, 849786 . 496
1699 7082
14

Quotient: 1713:138

By 495 thus, 649689 . 495
1299 6684
13

Quotient: 1312:249

By 494 thus, 738149 . 494
1476 9005
18

Quotient: 1494:113

By 493 thus, 874639 . 493
1749 12382
24 550
1

Quotient: 1774 : 57

By

By 492 thus, 384967 . 492
769 6619
13

Quotient: 782:223

By 491 thus, 782597 . 491
1565 14182
28

Quotient 1593:434

By 4999 thus, 9563487 . 4999
1912 5399
1

Quotient: 1913:400

By 4989 thus, 8746439 . 4989
1749 20678
4

Quotient: 1753:722

By 4988 thus, 9847635 . 4988
1969 26263
5

Quotient: 1974:1323

By 4987 thus, 4807198 . 4987
961 14691
2

Quotient: 963 : 4717

By 4986 thus, 9867458 . 4986
1973 30080
6

Quotient: 1979 : 164

By 4985 thus, 7596389 . 4985
1519 24174
4

Quotient: 1523 : 4234

By 4984 thus, 6873957 . 4984
1374 25941
5

Quotient: 1379 : 1021

By 4983 thus, 9978465 . 4983
1995 37380
7

Quotient: 2002 : 2499

By

By 4982 thus, 5879637 . 4982
1175 25787
5

Quotient: 1180 : 877

By 4981 thus, 8769578 . 4981
1753 37885
7

Quotient: 1760 : 3018

By 199 thus, 8476894 . 199
42384 42478
212 290
1

Quotient: 42597 : 91

By 198 thus, 5798634 . 198
28993 58020
290 600
3

Quotient: 29286 : 6

By 197 thus, 5976389 . 197
29881 89832
449 1379
7

Quotient: 30337

By 196 thus, 695837 . 196
3479 13953
69 429
2

Quotient: 3550 : 37

By 195 thus, 5347618 . 195
26738 133708
668 3448
17

Quotient: 27423: 133

By 194 thus, 973546 . 194
4867 29348
146 1024
5

Quotient: 5018 : 54

By

By 193 thus, 734698 . 193
3673 25809
129 912
4

Quotient: 3806 : 140

By 192 thus, 598768 . 192
2993 24112
120 1072
5

Quotient: 3118:112

By 191 thus, 697843 . 191
3489 31444
157 1457
7

Quotient: 3653:120

After this manner (reſpectively) Diviſions may be performed whatſoever the firſt and the laſt figures in the Diviſor be, ſo the middle figure or figures be 9 or nines.

By 1988 thus, 8375 0694 . 1988
4 1875 5031 94
251 4206
2

Quotient: 42128 : 230

By 2987 thus, 5973 6987 . 2987
1991 2 2598 43
86

Quotient: 19998 : 2961

By 3986 thus, 8597 1367 . 3986
2149 2 3042 55
76

Quotient: 21568 : 1319

By 4985 thus, 7913 4876 . 4985
1582 6 2422 66
48

Quotient: 15874 : 2986

By 3986 thus, 6849 8738 . 3986
1712 4 2424 74
60

Quotient: 17184 : 3314

By

By 5984 thus, 98573397 . 5984
1642 31669
5

Quotient: 1647 : 1749

By 6983 thus, 6794185 . 6983
970 20675
2

Quotient 972 : 6709

By 7982 thus, 8274673 . 7982
1034 21285
2

Quotient : 1036:5321

By 3976 thus, 5694738 . 3976
1423 36890
8 5082
1

Quotient: 1432:1106

By 4975 thus, 9738479 . 4975
1947 52154
10

Quotient: 1957:2404

By

By 5974 thus, 3897465 · 5974
649 18341
3

Quotient: 652 : 419

By 2967 thus: 8794367 · 2967
2931 98090
32 3146
1

Quotient: 2964 : 179

By 4965 thus, 6395748 · 4965
1279 45513
9

Quotient: 1288 : 828

By 2957 thus, 2859767 · 2957
953 32746
11 3176

Quotient: 964 : 219

By 3956 thus, 9486739 · 3956
2371 107063
26
1

Quotient: 2398 : 251

This

This way may be much further extended, to make many workes of Diviſion more eaſie then the ordinary way; but ſeeing by my plaine way which is only by Addition and Subtraction, any worke of Diviſion may be performed with eaſe, certainty, and ſpeed convenient: I doe therefore forbeare further to proſecute this kind of worke, only I will ſet down a few examples which may ſuit ſuch as affect curioſitie, being performed without ſetting downe any other number or figure, ſave only the Dividend, Diviſor, Quotient, and Remainder. In which examples I ſet the Diviſor higheſt, the Dividend in the middle, and the Quotient and Remainder under them both, which is only done for the orderly ranking of the examples following.

1998	1989	2998
57698	86795	985432
28:1754	43:1268	328:2088
2997	2967	2978
759865	79856	97659
253:1624	26:2714	32:2363

3989	3978	5987
297586	357786	274368
74:2400	89:3744	68:3252
39956	2967	3968
4738465	85376	94786
118:23657	28:2300	23:3522
4987	4986	4978
367984	73296	485672
73:3933	14:3492	97:2806
4945	4956	4988
98576	87789	867356
19:4621	17:3537	173:4432
5981	5982	5983
393786	478629	697342
65:5021	79:6051	116:3314
5984	5985	5986
747356	493785	987436
124:5340	82:3015	164:5732

5987	5988	5989
579472	896437	974682
96:4720	149:4225	162:4464
1978	2987	3986
87369	196563	254897
43:2315	65:2408	63:3773
4985	5984	6983
378572	744378	98735
75:4697	124:2362	14:973
7982	8981	9989
587693	785672	563874
73:5007	87:4325	56:4490

You may after this manner divide, though there be four or five figures in the Quotient, and yet finish it at two workings, thus,

11987	2987
75984649	84378649
6332 82965	28126 366287
6	122
6338:11045	28248 : 1873

4985

4985	6987
95683479	97538429
19136 290519	13934 181571
58	25
19194 : 1389	13959 : 6996

Now in this laſt example, and in the like caſes, the Diviſor is to be taken from the Remainder, and 1 more is to be added to the Quotient thus, 13960 $\frac{9}{6987}$

And ſo I leave theſe abridgments to bee inlarged by ſuch Readers as ſhall take pleaſure therein, which I preſume many will do; for (to a good memorie) this way will be as a pleaſing walk, affording the mind much recreation: but for my ſelfe, my memorie is but fraile, which makes me oftentimes unreadie, even in mine owne rules.

Rules

Rules of Practice performed only by Addition and Subtraction, after a more easie way, then (to my knowledge) hath been yet taught.

But thus much I desire of every one that would partake the benefit of these Rules, that he learne perfectly this rule ensuing, because it is of much use in this businesse.

An excellent easie Rule, teaching to divide any number by 12, *whereby to reduce pence into shillings, as it were* ex tempore.

TO doe this you must plant in your memorie this easie observation, namely, that 12^d is 1^s, 24^d is 2^s, 36^d is 3^s, 48^d is 4^s, 60^d is 5^s, 72^d is 6^s, 84^d is 7^s, 96^d is 8^s, and 108^d is 9^s. This may easily be setled in the memory, and hee that hath it readily, may set downe the number of shillings contained in any number of pence, as soone as he looketh upon it, without using Division at all.

* Examples follow in the Rules of Practice.

At 1^d the pound,
what shall 796538^{li}. cost.
$66378 . 2^d$
facit $3318^{li}\ 18^s\ 2^d$.

At

At 1^{d} what 947698

78974 . 10^{d}

facit 3948 . 14 . 10^{d}

This is as hard a queſtion of this kind, as can lightly happen, by reaſon the figures in the Quotient, which ſhews the number of ſhillings, fall out to be ſo great, and yet very eaſie, if heed be taken.

At 1$\frac{1}{2}^{d}$ what 76498

6374 . 10^{d}

3187 . 5

facit 9562^{s}.03^{d}

Or otherwiſe thus, if you will make it the aliquot part of 1^{s}.

At 1$\frac{1}{2}^{d}$ what 76498

38249

19124 . 6^{d}

facit 9562^{s}. 3$^{d}_{d}$

rs 478. 2. 3

At 13d what 578304
48192
626496
facit 31324. 16s. 0d

At 13 ½ what 87594
7299.6
3649.9
98543.3
facit 4927. 3. 3d

At 2 d what 706598
1413196
117766. 4d
facit 5888. 6. 4

Or thus, if you will make it the aliquot part of one ſhilling.

At 2d what 706598
take ½ 353299
then take ⅙ 117766. 4d
facit 5888. 6. 4

At 14d what 37849
In the adding of this you muſt double the Quotient. 3154. 1
44157, 2
facit 2207. 17. 2

At 3d what 5796
2898
1449
facit 72.9.0

At 15d what 91458
Before addition crosse out this middle number, or else add up the other two only. 45729
22864.6d
114322.6
facit 5716.2s.6d

At 4d what 73680
24560
facit 1228li 0s 0d

At 16d what 3827
1275.8d
5102.8
facit 255.2.8d

At 5d what 79465
39732.5
33110.5d
facit 1655.10s.5d

At 17d what 8749 or thus, 8749
This middle nũber must out before addition, or add up the other 2 only. 43745 2916.4
3645 . 5d 729.1
12394.5 12394.5
facit 619.14s.5d 619.14.5

At 6d what 93576
46788
facit 2339.8s.0d

At 18d what 5397
2698.6
facit 404.15.6

At 7d what 20915
10457.6
1742.11
12200.5
facit 610.0.5

At 19d what 6357
3178.6
529.9
10065.3
facit 503.5.3d

At 8d what 75642
take it for $\frac{1}{3}$ of 2s 2521 | 4
facit 2521li 8s 0d

At 20d what, 9457
4728 . 6
1576 . 2
15761 . 8
facit 788 . 1 . 8

At 1s 9d what, 35786
17893
8946 . 6
62625 . 6
facit 3131 . 5 . 6d

At 9d what 52964
26482
13241
39723
facit 1986 . 3 . 00

At 10d what 25784
257840
21486 . 8
facit 1074 . 6 . 8d

At 22d what 8349
4174 . 6
2783
15306 . 6
facit 765 . 6 . 6d

At 11d what 85746
ſubtract 1/12 7145 . 6
78600 . 6
facit 3930 . 0 . 6

At 23d what 8497
at 2s is 849 . 14s . 00d
708 . 1d
ſubtract 1/12 35 . 8 . 01
facit 814 . 5 . 11

Thus have I ſhewed for pence, and pence joyned with one ſhilling ſucceſſively: And now I ſhall proceed otherwiſe, And firſt for the aliquot parts of 20s or 1li. For 2s take the tenth part of the number given, by ſtriking off one figure; and doubling the ſaid figure, taking it ſo doubled for ſhillings, thus,

At 2s what 947 | 6
facit 947 . 12s . 00d

At 3ˢ 4ᵈ what 54817
take $\frac{1}{3}$ of the number 27408. 10ˢ
then $\frac{1}{3}$ thus, 9136. 3ˢ 4ᵈ
Thus having taken $\frac{1}{6}$ part facit 9136ˡⁱ. 3ˢ. 4ᵈ

At 4ˢ what 79436
take $\frac{1}{5}$ part thus 15887 $\frac{1}{5}$
facit 15887ˡⁱ $\frac{1}{5}$ or 4ˢ

At 5ˢ what 6987
take $\frac{1}{4}$ part thus, 3493. 10ˢ
facit 1746. 15. 0ᵈ

At 6ˢ 8ᵈ what 4738
take $\frac{1}{3}$ part thus, 1579ˡⁱ. 6ˢ. 8ᵈ

At 10ˢ take $\frac{1}{2}$ 7495
facit 3747. 10ˢ. 0

And now I ſhall ſhew an eaſie way to anſwer ſuch queſtiõs, where, in the given price, the ſhillings and pence are alike, or both one.

At 2ˢ 2ᵈ what 5479

10958
913. 2

21871. 2
facit 1093. 11ˢ. 2ᵈ

At $5^s\ 5^d$ what 6975

34875
2906.3

37781.3
facit $1889^{li}.1^s.3^d$

At $7^s\ 7^d$ what 3917

19585

27419
2284.11

29703.11
facit $1485.3^s.11^d$.

At $9^s\ 9^d$ what 4678

42102
3508.6

45610.6
facit $2280.10^s.6^d$

At $16^s\ 3^d$ what 7958

This you may take for 15^s, and 15^d, and doe thus,

39790

119370
9947.6

129317.6
facit $6465.17^s.6^d$

At 18^{s} 5^{d} what	3795
this is taken	18975
for 17^{s} & 17^{d}	7590
	64515
	5376 : 3^{d}
	69891 . 3
facit	3494 . 11^{s} . 3^{d}

At 21^{s} 8^{d} what	7958
taken for 20^{s}	159160
& 20^{d}	13263 . 4
	172423 . 4
facit	8621 . 3 . 4

So much for this manner of worke which you may uſe as you ſee occaſion.

At 37^{s} 5^{d} what	2409
In this Addition I triple the high-eſt number.	12045
	1003 . 9
	4818
	90136 . 9
facit	4506 . 16^{s} . 9^{d}

At 38ˢ 7ᵈ what,

In this addition you must either triple the higheſt nũber, or elſe ad up only the other 4, bringing in the ſecond of the twiſe, gaining a place.

	1978
	9890
	5934
	989
	164 . 10
	76317 . 10
facit	3815 . 17 : 10d

Or if you will multiply the number given by 38 after my way, thus,

Either way is eaſie enough.

1978	.	38
3956		5934
5934		15824
7912		75164
		989
		164.10ᵈ

Or you may worke this and the like yet more eaſily, by the way of ſubtraction, thus,

At 38ˢ 7ᵈ what	1978	1978
	3956	824.2ᵈ
	140.2ₛ.2	2802 . 2
facit	3815.17.10.	140.2.2

At 39^{s} what 9856

19712.0^{s}.0^{d}
492.16.0

facit 19219.4.0

At 2^{li} 4^{s} 5^{d} what 6948

13896
27792
2316
579
30687

1534.7^{s}0^{d}
13896.0.0

facit 15430.7.0

At 3^{li} 3^{s} what 847

2541
127.1.0

facit 2668.1.0

At 7^{li} 7^{s} per C what 395C

1975
2765
138.5.0^{d}

facit 2903.5.0

If

If 395 C coſt 2903^{li} 5^{s} 0^{d}, what 1 C?
Put the money into ſhillings is 58065^{s}, which divide by 395 thus,

58065	· 395
395	790
1856	1185
1580	1580
2765	1975
2765	(147^{s}
0000	is 7^{li}.7^{s}.0^{d}

If 7^{li} 7^{s} buy 1 C, what will 2903^{li} 5^{s} 0^{d} buy?
Put the money againe into ſhillings, and divide the ſame by the price of 1 C, turned into ſhillings is 147^{s} thus,

58065 ·	147
441	294
1396	441
1323	588
735	735
735	(395 C
000	

At 9li 9s the C, what 232 C 3q 14li

2088	
104.	8s. 0d
4.	14. 6
2.	7. 3
1.	3. 7½
facit 2200.	13. 4½

If 9li 9s buy 1 C, what will 2200li 13s 4½d buy? Here the mony must be turned into half pence, which may be done thus,

44013s } Add these, doubling the highest.
440134 }

528160d This divide by 9li 9s brought into
1056321 halfe pence, is 4536 halfe pence.

1056321	4536
9072	9072
14912	13608
13608	18144
13041	22680
9072	(232.3q.14li
3969	

3969 Turne this into
7938 quarters.
15876 Divide this by
13608 the ſame diviſor.

2268 Turne this into
11340 pounds by 28.
6804

63504 This by the ſame
4536 diviſor.

18144
18144

00000

If 232 C 3q 14li coſt 2200li 13s 04di/2 what 1 C. turne the weight into pounds, thus,

232
2324
23284 } In adding theſe, double the higheſt.
1

26082

Turn alſo the mony into half pence, is
1056321 multiply this by 112 thus,
1056321
2112642

1184

118307952	divide by	26082
104328		52164
139799		78246
130410		104328
93895		130410
78246		(4536 halfe^{d}
156492		2:68^{d}
156492		189^{s}
000000		answ. 9.9^{s}.0^{d}

If 2200^{li} 13^{s} 04^{d} buy 232C 3^{q} 14^{li} what 9^{li} 9^{s}? Turne the weight into pounds is 26082, multiply the same by 9^{li} 9^{s} in half pence, is 4536 thus,

26082	. 4536
52164	104328
78246	13:410
104328	78246
	156492
	118307952

118307952	divide by	1056321
1056321		2112642
1267585		3168963
1056321		4225284
2112642		5281605
2112642		(112^{li} is 1C
0000000		

This

This is a pretty hard queſtion, and being varied theſe foure waies, it affordeth direction for the anſwering of any queſtion that is to bee wrought by the rule of three, direct; And all this is eaſily performed only by Addition and Subtraction, as appeares by the worke.

There is a rule which is counted excellent to bring forth the anſwer immediately in pounds and ſhillings, when the given price conſiſteth only of ſhillings; yet me thinks it bringeth no great help, ſeeing it doth but ſave the labour of reducing ſhillings into pounds, whice is very eaſie to be done.

The rule is this,

At 8^s what 7978|3

15956 : 24^s

facit 31913 . 4

Here you ſee I ſtrike off one figure of the given number, being 3, which 3 I multiply by the price being 8^s makes 24^s, which I ſet downe under a line drawne as here you ſee: then I multiply the reſt of the number being 7978 by halfe the given price which is 4^s, ſo by redoubling thoſe foure figures, and bringing in at laſt the 24^s which did ariſe by the 3 cut off, I find $3191 3^{li}$ 4^s 0^d to be the anſwer to the queſtion.

But

But if the given price be an odd number, then you muſt leave that 1 which makes it odd, and worke by one half of the reſt, and for that 1 you muſt bring downe half the number that you multiply, thus,

At 17^{s} what 3895

1945|85^{s}
1167
194.10

facit 3310.15.0

The ſame queſtion by my way of ſubtraction, which, me thinks, is eaſieſt.

At 17^{s} what 3895

584.5

facit 3310.15.0

If Lead be ſold at 11^{li} 7^{s} 8^{d} the fother, what comes 749C 39 15^{li} to?

This queſtion requires directions: Firſt, take notice that 19C 2 9 0^{li} of lead makes a fother; to bring the hundreds into fothers, doe this, turne the weight into halfe hundreds, makes 1499. 1. 15. Divide this number by 39, thus,

1499

1499 . 39
17 78
117
329 156
12 195
17

(38 is as appears 38 fother, &C. 39. 15 li.

38

418li.00s.0d.

38 crowns is 9.10.0
38 half crowns is 4.15.0
38 two pences is 0.06.4

ſo the 38 fother come to 432.11.4

To know what the hundred comes to, at this rate, doe thus, turne the price into pence is 2732d, which divide by the ſame Diviſor already prepared, thus, 2732 (70d 2/39

Double this Quotient, and ſo it will appear that 140d and 2/39 of 1d is the price of 1C at this rate, which you may multiply by 8, thus, 273
000

140

is 1120d & 10/39

the 0C. 29 0li. 70 } 2/39
the 0. 1. 0. 35 }
14 17 1/2

The 1li with the fractions will be full 1 1/2

1244

1244
103.8
5.3.8
432.11.4

The full answer $437^{li}.15^{s}.0^{d}$

At 9^{li} 16s the tun weight, what 876C.2q.14li? You must know that 20C makes a tunne, this therefore is to be turned into tuns, as you turne shillings into pounds, thus,

876.2.14
is 43.16.3.14

which multiply by Subtraction is $387^{li}.00^{s}.00^{d}$
43 angels 21.10.00
43 crownes 10.15.00
43 shillings 02.03.00

so much the 43 tuns comes to 421:08.00
If you will be exact, turne the price into pence is 2352d 8.02.$10\frac{3}{5}$

429.10.$10\frac{3}{5}$

wherof $\frac{1}{10}$ for 1C is 117.$\frac{3}{5}$ this $\frac{3}{5}$ is not to be
Wth multiply by 16 585 is $9\frac{3}{5}$ added up.
is $117\frac{12}{5}$
$9\frac{3}{5}$
the $\frac{1}{2}$C, $58\frac{1}{2}$
the 14li $14\frac{1}{2}$
$1954\frac{3}{5}$

These

Theſe added together make $1954^{d}\frac{3}{5}$, which is $162^{s}.\ 10^{d}\frac{1}{5}$. that is, 8.2. $1c\frac{3}{5}$. which added to the former ſumme, viz. the price of the 43 tuns, makes $429^{li}.\ 10^{s}\ 10\frac{3}{5}$. the juſt price of the parcell.

But for the readier caſting up of the price of commodities ſold by the C weight, it will be very requiſite to remember this obſervation: Firſt, that by taking $\frac{1}{2}$ of the price of the C, you have the price of $\frac{1}{2}$ a C; by taking $\frac{1}{2}$ of that, you have the price of $\frac{1}{4}$ of a C, $\frac{1}{2}$ of that is the price of 14^{li}, and $\frac{1}{2}$ of that is the price of 7^{li}, ſo the reſt cannot be above 6^{li}: And for the finding of the price of 1^{li}, and ſo of $2^{li}, 3^{li}, 4^{li}, 5^{li}$, or 6^{li}, you may do thus: If the price of the C conſiſt of ^{li}, ^{s}, and ^{d}, take all the pounds from the price, together, with as many ſhillings as pounds, and for every pound and ſhilling ſo taken, reckon $2\frac{1}{4}^{d}$ to be in the pound weight, for the ſhillings remaining in the price of the C weight, triple them, and then divide them by 28, 14, or 7, and you ſhall have in the Quotient, the pence, the halfe pence, or the farthings that are in the price of 1^{li} weight. For example, at $7^{li}.\ 18^{s}$. per C, what comes 5^{li} weight to? 7 . 7 gives $15\frac{3}{4}^{d}$, reſts 11^{s}, which I triple, makes 33, wherein I find 7 foure times, and 5 remaines, which is 4 farthings, and $\frac{5}{7}$ of 19; ſo I quickly find that $16\frac{3}{4}^{d}$ and $\frac{5}{7}$ of 19, is the price of 1^{li} at the rate aforeſaid. And ſo conſequently 5^{s}, 5 groats, 18 farthings, & $\frac{4}{7}$ of 19, is the price of 5^{li}.

If there bee any pence in the price of the C weight, multiply them by the number of pounds, whereof you would know the price. If any ſhillings doe ariſe, triple them, and divide them then by 7, the Quotient will be farthings: For example, If the price in this queſtion had been 7^{li}, 18^{s}, 10^{d}, then I muſt have ſaid, 5 times 10 is 50^{d}, wherein I find 4^{s}, which I triple (letting the 2^{d} goe) it is then 12^{s}, wherein I find 7 once, and 5 remaines, therefore 1^{q}, and $\frac{5}{7}$ of one farthing, muſt have been added to the price of 5^{li}, ſo the price would be 7^{s}, 1^{d}, and $\frac{2}{7}$ of 1^{q}.

But, more eaſily to find the price of 1^{li}, having taken the pounds from the price of the C, the ſhillings remaining cannot be above 19; you may therefore take notice and remember this, that 18^{s} 8^{d} the C, is 2^{d} the ^{li}: 16^{s} 4^{d} the C, is $1\frac{3}{4}^{d}$ the ^{li}: 14^{s} the C, is $1\frac{1}{2}^{d}$ the ^{li}: 11^{s} 8^{d} the C, is 1^{1d} the $_{li}$: 9^{s} 4^{d} the C, is 1_{d} the ^{li}: 7^{s} the C, is $\frac{3}{4}^{d}$ the $\frac{7}{li}$: 4^{s} 8^{d} the C, is $\frac{1}{2}^{d}$ the $_{li}$: and 2^{s} 4^{d} the C, is $\frac{1}{4}^{d}$ the $_{li}$: and ſo from farthing to farthing you may know the price of 1_{li}. And from hence ariſeth an obſervation to know the price of the C, when you know the price of the ^{li}; for look how many farthings are in the price of the ^{li}, there is twice ſo many ſhillings, and once ſo many groats in the price of the C: For example, at $5\frac{1}{4}^{d}$ the $_{li}$, I ſee that this price contains 21 farthings: therefore I conclude, that 42, and 21 groats being 7^{s}, all 49^{s}, is

the

the price of the C, at that rate: But if the price of the li be ſomething great, and containe many farthings, then it will be ſomething troubleſome to reckon this way. In ſuch a caſe multiply the number of pence that is in the price of 1 li by 8, and to that product (taking it for ſhillings) add the ſixt part of it ſelfe, ſo ſhall you have the price of the C. For example, at 3ˢ 7ᵈ the li, what is the C? this price containes 43ᵈ, which I multiply by 8 thus,

43 and it makes 344ˢ.

whereunto I add	344	
for the more eaſe $\frac{2}{12}$	28 .	8ᵈ
	28 .	8
	401 .	4

ſo I conclude 20.01.4 is the price of the C.

And now to proceed. And here I conceive it will be very requiſite to ſet downe an example which may be a direction for the adding together of hundreds, quarters, and pounds, after the beſt and readieſt way, and for the caſting up of the price of commodities ſold by the pound, I have therefore ſet downe this familiar example, with the diſtinctive numbers, and tare, after the uſuall manner, which will be convenient for ſuch as are not practiſed in theſe affaires.

Indico 10 barrells . viz.

No 364 :	3^{c} .	2^{q} .	25^{li}	tare	45^{li} . 08^{om}.
578 :	3 .	1 .	27	tare	43 . 04
189 :	3 .	3 .	08	tare	39 . 12
375 :	3 .	1 .	23	tare	38 . 08
346 :	3 .	0 .	26	tare	42 . 00
349 :	3 .	1 .	15	tare	40 . 08
338 :	3 .	2 .	18	tare	37 . 04
395 :	3 .	3 .	17	tare	38 . 12
446 :	3 .	0 .	24	tare	39 . 00
564 :	3 .	1 .	19	tare	43 . 08
	35 .	1 .	06	tare	408 . 00

354
353

is suttle 3954
Tare 408 . 00

Rests net 3546.00 . at $4^{s}.7\frac{3}{4}^{d}$ ℔^{li}, is $823^{li}.14^{s}.01\frac{1}{2}^{d}$

7092

14184
1773
295 . 6
147 . 9
73 . $10\frac{1}{2}$

16474 . $01\frac{1}{2}$
facit 823 . 14 . $01\frac{1}{2}$

Here

Here you ſee I meddle not with thoſe 10 numbers next the left hand, for they ſerve for no other uſe, but to diſtinguiſh one barrell from another, ſo I begin with thoſe numbers towards the right hand, which you muſt conceive to be the tare, or weight of the cask or barrels, which being knowne, is ſet upon the barrells before they be filled, and beginning there with the ounces, it is not convenient to add them up together, but rather by looking upon the eights, fours, and twelves whereof they uſually conſiſt, you may eaſily perceive that theſe ounces make 4, li which I carry to the pounds, and add them up after the ordinary manner of Addition, as you ſee by the example. Then I goe to the pounds of Indico, and add them together, after ſuch a way as makes the worke much more eaſie, then as it is for the moſt part uſed to be done, which is this: Firſt, I add together all the digits, and they make 62, which 62 I carry to the articles, and ſo goe downewards with them, ſaying, 62.72.82.92. 102.112. then I note that, and begin againe, ſaying, 10.20.30.40.50.60.70.80.90. which is all; now I know, that ſeeing 84 is 3q. 50 is 3q and 6li, which 6li I ſet downe, and carry the 7q to the quarters, and adding them together, I find they make 21, which is 5C. 1q. The quarter I ſet downe and carry the 5C to the hundreds, which added together make 35 C, as by the example

appeares, then for the reducing of that 35 C into ſuttle pounds: In ſtead of multiplying it by 112, I only ſet it downe twice more, each time gaining a place towards the left hand, and then for the 19 and 6li I ſet downe 34 towards the right hand, as you may ſee by the example: and then adding thoſe 3 numbers together, doubling the higheſt, I find 3954 to be the ſuttle pounds, from which I ſubtract the tare, being the weight of the barrells, and ſo find the net weight of the Indico to be 3546li, and then for the caſting of it up, I redouble it for the 4s, and then take halfe of it for 6d, and then $\frac{1}{12}$ for 1d, the halfe of that for $\frac{1}{24}$d, and the halfe of that for $\frac{1}{48}$d. And ſo by adding thoſe together, I eaſily find 823li. 14s. $1\frac{1}{2}$d. to bee the juſt ſumme of money that the 10 barrells doe amount unto, as you ſee practiſed in the example. This way (for the eaſe it will bring) is very fit to be practiſed.

And now I remember one thing more, wherein directions will be requiſite: and that is, touching the ſmall C of five ſcoreli to the C weight, by which C they uſe to buy and ſell in many places beyond the ſeas. Touching which, for the finding of the price of the odd pounds, take this obſervation of mine; turne the price of the C into pence, then multiply them by the number of pounds, whereof you would know the price; from which product, ſtrike off 2 figures, the reſt

is

is the juſt number of pence that is in the price of the pounds which you ſeeke: and if you double the 2 figures ſtruck off, and then ſtrike off 2 figures, the reſt is the halfe penny, if any be more in the price of the ſaid pounds. And if thoſe 2 figures laſt ſtruck off doe make 50 or more, then there is yet one farthing more in the ſaid price, or elſe not. For example,

A Factor at Amſterdam ſends over a certaine commodity weighing net 3462li, at the price of 3li.22s.11d. Flemm. the C, how much doth it come to in Flemm. money? Firſt note, that by taking off 2 figures, you find the hundreds, which are here 34 which I triple thus,

	102.00s.00d
then take $\frac{1}{2}$ for the 10s	17. 00. 00
then the $\frac{1}{20}$ for 2s	03. 8 .00
then 34s leſſe 34d is	01. 11 .02
for the 50li is $\frac{1}{2}$ a C	01. 16. 05$\frac{1}{2}$
ſo I find the price of the 34C$\frac{1}{2}$ to be	125. 15. 07$\frac{1}{2}$

and now lacks only the price of the 12li

To know which I turne the price of the C into pence, is which being multiplyed by 12 as here you ſee, makes frō which I ſtrike off the 2 ciphers, & ſo I preſently find that the 12li come to 105d

875d
875
105|00

is

is 8, 9d, which added to the former, makes the whole price of the parcell 126.04. $04\frac{1}{2}$. And if I had desired to have knowne the price of the li, then by striking 2 figures from 875, the number of pence in the price of the C, it would have shewed $8\frac{1}{4}$d to be the price of the li. And now for the reducing of this Flemish into Starling mony, whereby the Merchant may know how much he must give his Factor credit for, supposing the exchange to be at 36s,2d. To doe it after a ready way, reduce the mony into half pence, because of the odd ob, is 60585, reduce also the rate of the exchange into half pence, is 868, by which divide the other number thus,

60585	. 868	
5208	1736	
8505	2604	
7812	3472	
6930	4340 (69 798	
6076		69.15.$11\frac{1}{2}$
8540		
7812		
7280		
6944		
336		

This Quotient being a decimall number, striking off the 3 figures for the 3 ciphers (which you may obserue) I have put to the remainder in my last three subtractions, whereby the three last figures in my Quotient are produced, it sheweth that 126li.04s. $04\frac{1}{2}$d Flemm. is 69li.15s. $11\frac{1}{2}$d Star. the exchange being as aforesaid: Now for

for the right accepting of theſe figures ſtruck off, every unite in the figure next the line, is 2^{s}, every unite in the next figure is $2\frac{1}{2}^{d}$, 5 in that place is 1^{s}, every unite in the third figure is almoſt one farthing, 5 in that place is $1\frac{1}{2}^{d}$ &c.

A direction for the adding together of Pounds, Ounces, Peny weights, and Graines, after the manner of Goldſmiths, who though they weigh their Ingots, Plate &c. as aforeſaid, yet they uſually buy and ſell by the ounce.

3^{li}.	9^{oun}.	16^{dwt}.	22^{gra}
2 .	11 .	14 .	18
2 .	08 .	17 .	15
1 .	07 .	12 .	21
0 .	10 .	15 .	17
12 .	00 .	17 .	21

First, you muſt know that 24 grains makes a penny weight, 20 peny weights makes an ounce, and 12 ounces makes a pound: ſo beginning with the grains, and adding them up, I find they make 93, wherein I have 24 three times, and 21 remaines, which I ſet down under the grains; then I carry the 3 to the penny weights, and adding them up, I find they make 77, and becauſe 20 of them makes an ounce, they are as it were of the nature of ſhillings, therefore I ſet downe 17, and for the 60, I carry 3 to the ounces, and adding up them, I find they make 48, and ſeeing 12 of them makes 1^{li}, they are of the nature of pence, I meane, they are to pounds as pence to ſhillings, there-

therefore I know this 48 ounces is juſt 4^{li}, which 4^{li} I carry to the pounds, and adding, doe find that they make 12_{li}: and here I omit to mention mites and droites, becauſe they are not of ordinarie uſe.

And now ſuppoſe this parcell be ſilver plate, ſold at $5^{s}\ 7^{d}\frac{1}{2}$ by the oũce, what doth it come to? The pounds muſt be reduced into ounces, thus,

12
12
144 which multiply by 5 thus, 144

720
72
12
6

ſo I quickly find that the 144 ou. come to 810
40.10.00

And now remaines to find what the odd weight comes to, being 17d weight, & 21 grains.
So for 10^{d} weight, I take $\frac{1}{2}$ of the price is $2^{s}.9^{d}.\frac{3}{4}$.
for 5^{d} weight I take $\frac{1}{5}$ of that, is $1 . 4\frac{7}{8}$
then for 2^{d} weight, & $\frac{1}{2}$ which includes 12 of the 21 grains, I take $\frac{1}{2}$ of the laſt. } $0. 8.\frac{7}{16}$.

Now to know the price of the 9 graines, as neere as needeth, I conſider that $5^{s}.6^{d}$ the ounce, is $3^{d}\frac{3}{10}$ the peny weight, and 9 graines is $\frac{3}{8}$ of the

the peny weight is about 0 . $1\frac{1}{4}$

00^{li} . 5^{s} . 00.

So 12^{li}. 0 ounces, 17^{d} weight, 21 gr. at 5^{s} $7\frac{1}{2}^{d}$ by the ounce, is 40 . 10 . 00

40 . 15 . $00\frac{1}{4}$

But forasmuch as it is something troublesome to find out the price of the peny weights; for an especiall and speedy helpe in this case both for gold and silver, or whatsoever is sold by this weight, take this easie observation of mine: bring the price of the ounce into pence, then strike off the figure next your right hand, and so having divided the number by 10, you have the halfe pence, and the parts of an halfe penny that is in the price of the penny weight. As for example, A Merchant hath sold a parcell of Barbery gold, weighing 145 ounces, 7^{d} weight, 12 graines, at 3^{li}, 7^{s}, 8^{d} the ounce, how much must hee receive for it?

145

435

48 . 6_{s} . 8_{d}

7 . 5 . 0

490 . 11 . 8

Thus I presently find by tripling, taking the third

third and the twentieth, that the 145 ounces come to 490li.11s.08d, then I turne the price of the ounce into pence thus,

67 It makes 812d, which I multiply by 7½ thus
678

812

812
4060 } I double the highest.
406

The price of 7d 609½
weight 12 gra.
I thus find to be 3s 4d half penny.
25s 4½d.

So you see this worke is presently and easily done, and the mony to be received is found to be 491li.17s.00½d: you may also for your ease observe with mee, that for every shilling that is in the price of the penny weight, you may reckon one halfe penny to be in the price of the graine, for every tester, one farthing; and for every three pence, halfe a farthing; so shall you presently and easily find, that at 3s 5d the penny weight, the graine comes to three halfe pence halfe farthing, and ⅔ of halfe a farthing, or ⅓ of one farthing, &c.

These easie rules are very necessary for all such whom they may concerne: And here it would come aptly in, to set downe something that may be convenient to be knowne, by such as trade with the mint; But forasmuch as I have not

not knowne it yet taught by any, and having heard ſome of the mynt call it a myſterie, I have ſomewhat doubted whether I might do it without offence to any, yet (upon debatement) I have thought it not meet to omit that which I conceive may be convenient for many, and (for ought I know) prejudiciall to none; I will therefore propound and anſwer a queſtion, which may be a good direction for thoſe that wil make uſe of it, which ſhall be this.

A Goldſmith or Merchant carries to the mynt to be converted into coyne, two ingots of gold, weighing as followeth.

No. 1 : 6^{li}. 10^{oun}. 18^{d} ^{wt}. 19^{gr}. found by the ſay worſe 1$\frac{3}{4}$ ^{gr}.

2 : 4. 06 . 14 . 15 ^{gr} found better 2$\frac{1}{4}$ ^{gr}.

What weight of coined gold ſhall hee receive from the mynt for theſe 2 ingots?

This queſtion is ſomething hard to be anſwered, ſo that I am perſwaded there are many that trade with the mynt, that doe not examine their buſines in this point, but take it upon truſt from the Clarkes of the mynt, who (no doubt) doe them right; yet I think it fit that every man (for his owne ſatisfaction) ſhould be able to examine his owne buſineſſe, for errors may happen: nor is this golden queſtion ſo hard, but that the golden

den Rule will quickly reſolve it, if rightly applyed thereunto, for therein the moſt difficulty conſiſteth. And for an helpe in this, you muſt take notice, that theſe graines which ſhew the worſeneſſe or betterneſſe of theſe ingots, are not ordinarie graines, but carrect graines, every one of them being 4 ordinarie graines, and foure of them make a carrect. You muſt likewiſe know, that gold of 22 carrects fine, is ſtanderd, and ſo much as it is found by the ſay Maſter, to want, or to exceed 22 carrects, ſo much he reports it to be worſe, or ſo much better, as they know that deale in theſe affaires.

And now to ſhew the manner how to bring theſe kind of queſtions aptly to the golden rule, the eaſieſt way for the avoiding of fractions, will be to reduce the 22 carrects ſtanderd into ordinarie graines, which (by that which I have related) you may conceive will be done by multiplying the ſame by 16, the product whereof will be the firſt number for the ſaid rule, the ſecond number will be the ingot reduced into graines, and the third number will be the firſt, only diminiſhed by ſubtracting the worſeneſſe, or increaſed by adding the betterneſſe, according to the ſay Maſters report: This is the rule, which you will the better underſtand by the example following.

And

And first for the Ingot nº. 1 cont. 6li. 10oun. 18dwt. 19gr. worse 1¼gr. I thus reduce it into graines.

6
60
1
82
1648
1
1658
3316 } Double both.
19
39811 gra.

This is the second number for the rule.

Then find the first thus,

22
110
22
352

this is the first

To find the third, you must bring the report into ordinarie graines, by multiplying it by 4; which being done, the report of this first ingot will be worse 7 ordinarie graines, this you must subtract from the first number thus,

352
7
345

so resteth the third number, being

And now the queſtion will ſtand thus, If 352 ſtanderd, produce 39811 graines being weight for weight, what will 345 produce?

In this golden Rule direct, you muſt know, that you muſt alwaies multiply the ſecond and third numbers together, and divide that product by the firſt, the Quotient gives the anſwer; And now in the working of this queſtion, I would have you take notice of the eaſineſſe of my way of Multiplication and Diviſion.

```
  39811 . 345
 ------
 119433
 159244
 199055
 ------
13734795

13734795 .  352
1056         704
-----       1056
 3174     -  1408
 3168        1760
-----       -----
 000679     (39019|3/10 gra.
    352
    ---
    3275
    3168
    ----
     1070
     1056
     ----
       14
```

And thus the queſtion is anſwered touching the firſt ingot, now the Quotient would have been 39019 graines, and $\frac{107}{352}$ of one graine; but be-

cauſe

cauſe I would teach all the helps that may be, I have here ſhewed a readie way to bring ſuch fractions into a nearer ſcantling, to have their value (or ſo much thereof as is requiſite) eaſily diſcerned, which you ſee I did here performe, only by putting a cipher to the ſaid 107, the numerator of the ſaid fraction, and then finding my Diviſor three times in that number, I ſet 3 in my Quotient, but part it from the reſt with a little line as you ſee, ſo the Quotient is 39019 grains, and $\frac{3}{10}$ of one graine, the 14 remaining may be called $\frac{14}{35}$ of $\frac{1}{10}$, or $\frac{14}{350}$ of one graine, which is all one, This Quotient you may reduce thus,

39019 . 24
24 48
72
150 96
144 120
61
48 (1625 dwt
81 . 5 dwt
139 6li. 9oun. 5dwt. 19gr $\frac{3}{10}$.
120
19gr.

Or take $\frac{1}{12}$ and then halve it to find the peny weights thus,

39019
3251 . 7
1625 . 12
1625 . 19gr

So it appeares that for the ingot nº. 1. there is to be received from the mynt in coined gold, 6li. 9 ounces. 5d waight, 19 grains, and $\frac{3}{10}$ of one grain.

For the ſecond, viz. nº. 2. qr. 4. 6. 14. 15. better $2\frac{3}{4}$ graines, it being reduced into graines after the manner aforeſaid, will be 26271 grains, the ſay maſters report being reduced into ordinarie graines as before is taught: wil be better 9 grains, which being added to 352 (the ſtanderd) it makes 361. So then this queſtion ſtands thus, If 352 produce 26271 graines, what 361?

Multiply thus, 26271 . 361

78813

157626

divide thus, 9483831 . 352

704 | 704

2443 | 1056

2112 | 1408

3318 | 1760

3168 | (26942 | 7/10 gr. 24

1503 | 24 | 48

1408 | 29 | 72

951 | 24 | 96

704 | 54 | 120

2470 | 48 | (1122 dwt 14 gr 7/10

2464 | 62 | 56.2.14

0006 | 48 | 4 li. 8 ou. 2 dwt 14 gr 7/10

14

And

And thus it appeares, that for the ingot nº.2.qt.4li.6oun.14dw.15gr. there muſt be received from the mynt

	4.8.02.14$\frac{7}{10}$.
and for nº.1.	6.9.05.19$\frac{3}{10}$.
For both	11.5.08.10

Now the 2 fractions remaining in the 2 Diviſions, which you ſee, I did with no trouble reduce to $\frac{7}{10}$, and $\frac{3}{10}$ making one graine; if they had with a great deale of trouble beene added together, would have made ſomething more then a graine, but it would have beene leſſe then the tenth part of a graine, and therefore not materiall; but if I would have brought it yet nearer, I ſhould have put to another cipher in each Diviſion, and then I had brought it within the hundreth part of a graine: and a third cipher would have brought it within the thouſand part of a graine.

This is a touch of the decimall Arithmetick, whereof perhaps I may write ſomewhat hereafter. And here you may yet further take notice, not only of the aptneſſe to performe many multiplications this way without removing the numbers for Addition, but alſo, of the great conveniencie that is in this kind of Diviſion, for this one Diviſor being once prepared as here you ſee, is then readie for the ſpeedie reſolving of any queſtion

ſtion of this nature, whatſoever it be, ſo long as the ſtandard ſhall continue 22 carrects fine.

A direction for the caſting up of the price of oyles, ſold by the tunne and by the gallon.

At 44li. 15s 00d. the tunne, what is the price of the gallon? Turn this price into ſhillings is 895; which divide by the number of gallons that is in the tunne, being 236 thus,

	895	. 236
	708	472
	187	708
turne this remainded into pence thus,	187	944
		1180
then goe on in Diviſion,	2244	($3^s.9^d\frac{5}{10}$ of 1^d
	2124	
	1200	
	1180	
	20	

Here it preſently appears, that at 44li 15s the tunne, the gallon comes to 3s, $9^d\frac{1}{2}$ and ſomewhat more, but not materiall.

This diviſor alſo, being thus once prepared, is readie to reſolve any queſtion of this kinde, touching liquid commodities, whereof 236 gallons

lons goeth to the tunne. It will therefore be neceſſarie for ſuch as deale in ſuch commodities, to have this Diviſor by them ready prepared, ſo ſo they may be eaſed of that little paines in preparing it.

At 3ˢ 9ᵈ the gallon, what the tunne?
The tun is 236 gall.

708
118
59
885

facit 44.05ˢ.00ᵈ.

At 52ˡⁱ 07ˢ the tunne, what 17 gallons?

1047
5235
2094

} Thus it is multiplyed by 17, the number of gallons.

17799 . 236
1652 472
708
1279 944
1180 1180
990 (75|41
944
460
236
224

Here you may obſerve, that when I had by two ſubtractions fonnd 75^{s} to be the price of the 17 gallons, and 99 remaining in the Diviſion, inſtead of turning this 99 into pence (as in the former example) I add a cipher to it, and then goe on with the diviſion, knowing by my owne obſervation, that every unite that ſhall be in the figure that falleth then next in my Quotient, is 1^{d}, and $\frac{1}{5}$ of 1^{d}, ſo the 4 in this Quotient is 4$^{d}\frac{4}{5}$, then I put a cipher to the next remainder, wherein I can yet have my diviſor but once; I therefore ſet 1 in my Quotient, which 1 is $\frac{1}{180}$ part of 1^{s}, or $\frac{3}{25}$ of 1^{d}, or $\frac{12}{25}$ of 1^{q}: therefore you may perceive, that every unite contained in the figure that ſhall fall into the Quotient by reaſon of the putting to of the ſecond cipher, is almoſt halfe a farthing, 5 in that place is 1 ob. and $\frac{1}{5}$ of 1 ob. And to conclude, I doe eaſily perceive by this Quotient, that the price of 17 gallons of oyle at 52^{li}. 7^{s}. the tunne, is almoſt, but not altogether, 3^{li}. 15^{s}. 5^{d}, and may well be taken for 3. 15. 4$\frac{3}{4}$.

So you ſee by this obſervation, you may preſently reſolve any queſtion of this kind as neere as can be paid in coine, without turning the ſhillings into pence.

Now if you would by a mentall computation without the uſe of the pen, know the price of the gallon when you know the price of the tun,

and

and likewiſe the price of the tunne, when you know the price of the gallon, to ſuch a neereneſſe as may give ſatisfaction, you may obſerve this; for every 1li or 20s that is in the price of the tun, you may reckon 1d to be in the price of the gallon, for every 10s you may reckon 1 ob. and for every 5s, 1q. And moreover, for every 15li that is in the price of the tunne, you may add 1q to the pence that is in the price of the gallon. For example, at 30li 10s the tun, I preſently know that for the 30li, there is 30d in the price of the gallon, for the 10s, there is 1 ob. and for that 30li, includes twice 15li: therefore there is 1 ob. more in the price of the gallon, ſo the price is 2s 7d the gallon, or very neare it: ſo at 37li 10s the tunne, the price of the gallon will eaſily be found to be 3s 2d, and halfe a farthing, ſeeing every 7li 10s produceth half a farthing, and ſo forward.

And to find the price of the tunne, you may reckon for every penny that is in the price of the gallon, 19s 8d to be in the price of the tunne, or ſo many pounds as there is pence in the gallon, leſſe ſo many groats. For example, at 4s 7d the gallon, the price of the tunne is 54li. 1s, 8d, that is, 55li leſſe 55 groats. And for every ob. reckon 9s. 10d. for every farthing 4s. 11d. &c.

For the avoiding of the trouble of meaſuring of oyles ſold by the gallon, there is an order to find out the meaſure by weight, reckoning $7\frac{1}{2}$li

to make a gallon, ſo every pound is 1 pinte, and $\frac{1}{15}$ part of a pinte.

For reducing the weight into meaſure, firſt, bring the weight into pounds, then double that number of pounds, and divide that totall by 15, the Quotient will ſhew the number of gallons, if any thing remaine, every unite therein, is $\frac{1}{2}$ a pinte, and $\frac{1}{15}$ part of $\frac{1}{2}$ a pinte. Example, ſuppoſe a a caske is filled with oyle, the net weight of the oyle (the tare of the caske being deducted) is found to be 3C. 3q. 24li. this makes ſuttle 444li. doubled is 888li. which divide by 15 thus,

888 . 15
75 30
138 45
135 60
3 75
(59. $\frac{3}{15}$

or you may abreviate this diviſion after my rule, thus,

888
177
59 $\frac{3}{15}$

So this quickly appeares to be 59 gallons, 3 halfe pints, and $\frac{3}{15}$, or $\frac{1}{5}$ of halfe a pint.

This me thinks is ſo eaſie, that it needeth no helpe, yet for the making of a mentall computation, or at leaſt, for the doing of it without Diviſion, you may take this rule or obſervation of me, For every C weight, reckon 15 gallons, for every $\frac{1}{4}$ C, reckon $7\frac{1}{2}$ gallons &c. but with this caution,

on, that there be ſome odd pounds beſides your hundreds, $\frac{1}{2}$ hundreds &c. out of which odd pounds you muſt for every C, abate $\frac{1}{2}$ a ^{li}. for every halfe C, $\frac{1}{4}$ of a ^{li} &c. and then reckon the reſt of the odd pounds as aforeſaid, viz. every pound for 1 pint and $\frac{1}{15}$. As for example, ſuppoſe a parcell of oyle weigheth net 4C. 2^{q}. 10^{li}. this rule preſently ſhewes that the 4C, and 2^{q}. is 67 gallons, and 2 quarts, but then for the ſaid 4C and 2^{q} I muſt take $2\frac{1}{4}$ out of the 10 odd pounds, then will reſt $7\frac{3}{4}$^{li}, whereof I know $7\frac{1}{2}$^{li} is one gallon, and the other $\frac{1}{4}$ of a ^{li}, is $\frac{1}{4}$ of a pint, and a very little more: ſo I preſently know by this rule, that 4C. 2^{q}. 10^{li}, makes 68 gallons, 2 quarts, and $\frac{1}{4}$ of a pinte.

If oyle be bought at 53^{li}, 8^{s} by the tunne ready mony, how may it be ſold at 4 moneths time, to gaine 7 by the C? Turne the price into ſhillings is 1068^{s} which multiply by 7 thus,

5340

7476 This totall muſt be added to the price, gaining 2 places towards the right hand thus,

1068
7476
114276

From this totall ſtrike off 2 figures, ſo it will appeare, that it muſt be ſold at 1142^{s}, and $\frac{76}{100}$ parts

of

of 1ˢ by the tunne, which is $9^{d}\ \frac{12}{100}$, to gaine 7 by the C, which is $57^{li}, 2^{s}, 9^{d}$, and $\frac{12}{100}$ of 1 d.

If oyle be bought at $58^{li}.\ 14^{s}.\ 6^{d}$ by the tunne at 12 moneths time, how may it be ſold by the gallon for readie mony, looſing 6 by the C? Turn the price into pence is 14094^{d}, which multiply by 6 thus

14094
70470

84564

This totall muſt be taken from the price, thus,

14094
84564

1324836 Divide this by 23600
118000 ($56^{d}\ \frac{3236}{23600}$ 47200
---- 70800
144836 94400
141600 118000
---- ----
3236

This Quotient ſhewes, that oyle bought at $58^{li}, 14^{s}, 6^{d}$ by the tunne, may be ſold at 56^{d}, and $\frac{3236}{23600}$ parts of 1ᵈ by the gallon, to looſe juſt 6 by the C, the price of the gallon, is $4^{s}\ 8^{d}$, and ſomething more then halfe a farthing.

Queſtions

Queſtions concerning raw ſilke, bought by the great pound of 24 ounces, and being throwne or twiſted, is then ſold by the ſmall pound of 16 ounces.

For the reducing of great pounds into ſmall, or ſmall into great, if you add to the number of great pounds, the halfe of the ſame number, that totall is ſmall pounds. Example,

647 great pounds.
323½

970½ ſmall pounds.

Likewiſe if you take from the ſmall pounds ⅓ part of the ſame number, that remainder is great pounds. For example,

970½ ſmall pounds.
323⅚

647 great pounds.

In a bale of ſilke weighing 3C. 1q. 25li. how many great pounds,

336
28
25

389
129⅔

facit 259⅓ or 8cw
1f

If raw ſilke coſt 23ˢ.8ᵈ. the great pound, how may it be ſold by the ſmall pound, to gaine 12 by the C. towards charges and waſt in throwing? Turne the price into pence is 284ᵈ, which multiply by 12 thus,

284
568
3408

Add this totall to the price thus, 284
2408
31808
deduct $\frac{1}{3}$. 10602 $\frac{2}{3}$
21205 $\frac{1}{3}$

From this remainder ſtrike off 2 figures, and then it will ſhew, that the ſmall pound may be ſold at 212ᵈ, and $\frac{5}{100}$ of 1ᵈ, and $\frac{1}{3}$ of $\frac{1}{100}$, all is 17ˢ.8ᵈ, and $\frac{4}{75}$ of 1ᵈ.

For the reducing of Flemiſh ells into Engliſh, and Engliſh ells into Flemiſh.

You muſt note, that 5 ells Flemm. is 3 ells Engliſh; and ſo 3 ells Engliſh is 5 ells Flemm. ſo the one is done by multiplying by 3, and dividing by 5, the other by multiplying by 5 and dividing by

by 3, which is moſt readily done thus: If you would turne Flemiſh into Engliſh, triple your number of Flemm. ells, and then ſtrike off one figure, the reſt being doubled, are Engliſh ells, and the figure ſtruck off, is ſo many fift parts of an Engliſh ell; therefore if it be 5, you muſt reckon it for one ell, and put it to the reſt in doubling of it, and what it containes above 5, is ſo many fift parts of an Engliſh ell For example.

7589 Flemm. ells.
2276|7 tripled.
4553⅖ Engliſh ells.

This I thinke is rather eaſier then to multiply by 6, and then divide by 10, by ſtriking off one figure, both waies doe readily reduce Flemm. ells into Engliſh: If you would turne Engliſh into Flemm. put a cipher to your number, then halve it, the third of that halfe are Flemm. ells, but if there be a fraction, then inſtead of the cipher, put that figure that will ariſe by putting a cipher to the numerator of the fraction: For example, 4553⅖ Engliſh, putting a cipher to the numerator of this fraction, it makes ⅕° which is 4, therefore I ſet 4 to my number of ells, thus,

45534
halved 22767
thirded 7589 Flemm. ells.

For

For the reducing of Amſterdam weight into Engliſh weight.

You muſt note, that 100li Amſterdam weight, is 108li Engliſh weight.

In 7894li Amſterdam weight, how many C Engliſh weight?

You muſt firſt bring it into Engliſh pounds, thus,

7894	7894
15788	63152
63152	852 52

Thus I quickly find, that 7894 pound Amſterdam weight, is 8525 pound, and $\frac{52}{100}$ which is $\frac{1}{2}$ a pound, and $\frac{2}{100}$ of a pound Engliſh. And now for the bringing of theſe pounds into hundreds, they are to be divided by 112, which you may very eaſily doe, if you remember the rule which I taught for the reducing of pence into ſhillings, which in this caſe alſo is very uſefull; the 3 figures here from which the firſt ſubtraction is to be made, are 852: now you know by the ſaid rule, that 8 times 12, or 8s, is 96d: therefore except this number were 896, you cannot take 8 to be the firſt figure in your Quotient, you may therefore conclude that it muſt be 7 which you muſt ſet in your Quotient, and then ſeeing every 100 muſt have 12 with it, and knowing that 7 times 12 is 84, therefore take 784 from 852, and ſo

goe

goe on with the Diviſion, thus,

8525 (76
784
685
672
13

And ſo it will quickly appeare, that 7894^{li} Amſterdam weight, is 76C 0^{q} 13^{li} $\frac{1}{2}$ and $\frac{2}{100}$ or $\frac{13}{50}$ part of one pound Engliſh weight.

If you would turne Engliſh weight into Amſterdam weight, bring the hundreds into ſuttle pounds, double that number, then divide that number by 27, and take the Quotient from the ſuttle pounds, the remainder are Amſterdam pounds. For example, in 342C 2^{q} 18^{li} Engliſh, how many pounds Amſterdam weight?

This makes ſuttle 38378^{li}, which doubled is

76756 . divide by 27

54 (2842 $\frac{22}{27}$ 54
227 81
216 108
115 135
108
76
54
22

38378
2842 $\frac{22}{27}$
35535 $\frac{5}{27}$

Thus it appeares, that 342C 2q 18li Engliſh, is 35535 $\frac{5}{27}$ pounds Amſterdam weight. Now to reduce this back into Engliſh pounds will be a little troubleſome, by reaſon of the fraction, yet that you may perceive the manner how to deale with a fraction, (though I think it ſeldome happeneth in this buſineſſe) I will bring this back thus,

35535 $\frac{5}{27}$	35535 $\frac{5}{27}$
71070	2842 | 80 $\frac{40}{27}$ or 81 $\frac{13}{27}$
2842 80 $\frac{40}{27}$	

Now for the performance of this Addition, you ſee here is $\frac{80}{100}$ and $\frac{40}{27}$ of $\frac{1}{100}$ to be added to $\frac{5}{27}$, I find by multiplying 80 by 27, and thereunto adding 40, and putting 2 ciphers to the 27, that the two lower fractions doe make $\frac{2200}{2700}$ which is $\frac{22}{27}$ which being added to $\frac{5}{27}$, makes $\frac{27}{27}$, which is 1 unite, and in this place 1li, ſo finding that the fractions make 1li, that I add up with the reſt, and it makes 38378li, agreeing with the Engliſh ſuttle pounds as appeareth.

I had prepared ſome rules and obſervations for the readie caſting up of Intereſt, the like (I think) not yet taught by any, but in regard the Stationer that hath the Copie of my little booke called *Webſters Tables* for Intereſt, hath lately reprinted it, being the third Impreſſion, in that regard I have forborne to publiſh my ſaid rules at large,

large, onely I will here briefly touch upon one or two of them, which are for the caſting up of direct Intereſt at 8 and 7 per Cent. from whence the ingenious Reader may gather skill to performe the buſineſſe with ſuch eaſe, as may give him cauſe to prefer this way before any ordinary way yet taught: and (if he pleaſe) he may call it *Webſters way.* The Rule for 8 per C is this, If the ſumme of money whereof you would know the Intereſt conſiſt only of pounds, and will be evenly thirded, then doe but multiply $\frac{2}{3}$ of it by your number of moneths; from that product ſtrike off 2 figures, ſo have you the juſt Intereſt of that number of pounds, for thoſe moneths; or if your number of moneths will be evenly thirded, then multiply your number of pounds by $\frac{2}{3}$ of your number of moneths, from that product ſtrike off 2 figures, ſo have you the juſt Intereſt as aforeſaid. Now for the accepting of the figures ſtruck off, every unite in the firſt figure next the line, is to be taken for 2^s: every unite in the ſecond figure, is $2\frac{2}{5}^d$: 5 in that place is 1^s, and every unite in the third figure, may be taken for one farthing (though it is not fully ſo much) 5 in that place is $1\frac{1}{5}^d$, every unite in the fourth figure ſtruck off, is almoſt $\frac{1}{10}$ part of one farthing &c. If your ſumme conſiſt of pounds and ſhillings, then make it a decimall number; you may perceive by that which is ſaid, that if the ſhillings be even,

then the ſetting to of one figure ſerveth to expreſſe them, if they be odd, then 2 figures expreſſeth them: ſo 25li 18s is expreſt thus, 259: 25li 19s thus, 2595. Having thus ſet downe your ſumme, if either that number, or your number of moneths will be evenly thirded, then doe as aforeſaid, cutting off one or two figures, the more according as you put to figures to expreſſe the ſhillings: if your ſumme be pounds only, and wil not third evenly, then put 2 ciphers to it, and then ſubtract a third as aforeſaid, letting now the fraction in thirding paſſe, as of little value: that remainder being multiplyed by your number of moneths, and 4 figures cut from the product, gives the anſwer. If there be alſo ſhillings in your ſumme, and thoſe even, and ſo expreſt with one figure, then put to one cipher: if odd, and ſo expreſt with 2 figures, then you need not put to any cipher, but working as aforeſaid, and cutting off 4 figures, you have the anſwer.

Now for the finding of the Intereſt for daies: If your ſumme be pounds only, put to a cipher; if pounds and ſhillings, put to a figure inſtead of the cipher to expreſſe the even ſhillings, then multiply by your number of daies, and divide by 45, the Quotient ſtriking off 3 figures, gives the juſt Intreſt for thoſe dayes, according to 30 daies to the moneth, but that being ſomewhat too much, you may remit thereof 1d in the noble, that

is,

is, 3^{d} in the pound, &c. ſo ſhall you have it neere enough to exactneſſe.

Now ſeeing it is ſomewhat troubleſome to divide by 45 the common way, if you looke back to my abridgements of diviſion, you ſhall find a ready way to divide by 45 without any ſhew of Diviſion, and beſides, in divers caſes you may abridge this buſineſſe, for if it be for 9 daies, doe but double your number of pounds, then ſtrike off 3 figures as aforeſaid: but if you put to a figure to expreſſe the ſhillings, then ſtrike off 4 figures; for 18 dayes, redouble your number, then doe as aforeſaid; for 27 dayes, add your doubled and redoubled numbers together; alſo for 5 dayes, put to a cipher for pounds, a figure for pounds and ſhillings, then third your number twice, and ſtrike off three figures as aforeſaid: for 10 daies, double your number, for 15 daies, triple it; for 20 dayes redouble it &c. and then third it twice as aforeſaid, not regarding any fraction that ſhall fall in this work, and then ſtriking off 3 figures, and remitting ſomewhat as aforeſaid, you have the Intereſt for thoſe dayes.

Now for 7 per centum, the readieſt way that I can find, is to multiply your number by 7, and that againe by your number of moneths, to that product put a cipher, if your number were poũds only, or elſe not, then divide that product by 12, which (after my way) is eaſily performed

without any appearance of Diviſion, then ſtriking off three figures, you have the juſt Intereſt for thoſe moneths. And this will alſo admit of ſome abridgement, for if it be for 12 moneths, then you need doe no more but multiply by 7; ſtriking then off 2 figures for only pounds, and 3 for pounds and even ſhillings; for 6 moneths, doe but multiply by 7, and then take $\frac{1}{2}$ of your number, for 4 moneths $\frac{1}{3}$; and for 3 moneths $\frac{1}{4}$; in all cutting off due figures as aforeſaid: alſo for 8 moneths doe but multiply by 7, and then ſubtract $\frac{1}{3}$; for 9 moneths, ſubtract $\frac{1}{4}$, doing then as aforeſaid; but if your ſumme be pounds only, and fall not even in taking the third or fourth, then you muſt put to a cipher, that ſo there may be three figures to cut off. For dayes, you may remit ſomewhat of 5^{d} by the day for every 100^{li} &c.

And now (me thinks) I ſhould be ſomewhat too ſhort, if I ſhould leave this buſineſſe, before I have alſo ſomewhat toucht upon another neceſſarie rule of mine, which is for the caſting up of Intereſt to rebate at 8 per Centum, which is (briefly) this,

The money to be paid upon rebate being pounds, or pounds and ſhillings, being ſet downe wholy in decimalls (as is formerly taught) muſt be your Dividend: your Diviſor muſt be 100^{li}, and the Intereſt thereof for your number of moneths: now that Intereſt will alwaies be either

ther only pounds, or elſe the odd money will be either 13li 6s 8d, or 6li 13s 4d: if it be 13li 6s 8d, you muſt put 4 ſixes to your number of pounds, if 6li 13s 4d, then you muſt put thereunto 4 threes, and then performing the Diviſion, putting ciphers ſtill to your Dividend, till there fall three fraction figures in your Quotient, and then ſtriking them off, you ſhall there find the readie monie that will cleare the debt: All this may be readily performed, my way having made Diviſion ſo eaſie; if there be pence in your ſumme, you may leave them out in the worke, but then forget not to add them to the ready mony in the Quotient; if the time be for moneths and daies, then multiply the daies by 22, add that product to your Diviſor, letting the laſt figure or cipher ſtand in the third place from your pounds or prime line, then dividing as aforeſaid, the Quotient gives the anſwer. And this way for the finding of the Intereſt for daies, is readier then by any tables; for the Intereſt to rebate for dayes, doth differ, and is more or leſſe, as the moneths are in number more or leſſe, which thoſe dayes do ſucceed. Or if the time be even moneths, then it will be a good and ready way to turne your ſumme of money into groats for your Dividend, putting 3 ciphers to it. And alſo 100 pound, and the Intereſt thereof for thoſe moneths into groats, for your Diviſor, and then performing

Diviſion, and ſtriking off 3 figures from your Quotient, you have the ready mony that payes the debt as aforeſaid. And ſo much briefly for this buſineſſe of Intereſt, which I was loath to ſet downe, yet more loath to omit, a generall regard, overſwaying a particular reſpect.

But for further and full ſatisfaction, touching Intreſt, ſimple or Compound, direct or to rebate, with the true valuation of Annuities, Leaſes, Fines and Reverſions, I refer the Reader to my ſaid booke of Tables, which for variety, truth, and plainneſſe, is found worthy of good acceptance, and is ſold by Mr *Nicholas Bourne* at the South Entrance of the Royall Exchange.

A Treatiſe touching *Fractions.*

ALthough my chiefe intent was in this Treatiſe, to teach my owne obſervations, yet my deſire that it may profit many, hath led mee to inlarge it, ſo as not to leave out any thing which I thinke neceſſarie io be learned by ſuch, as are to follow ſuch buſineſſes as belong to trade and traffique, I have therefore thought good to teach ſomething alſo touching fractions, as I have done for whole numbers, & that as plainly and briefly as I can.

A Fraction is an unite broken into parts, called there-

therefore a brokcn number, and doth as much decreaſe downwards leſſe then one, as whole numbers doe increaſe upwards more then one; a fraction is uſually writ with two numbers ſet one over the other, and a ſmall line betweene them thus, $\frac{3}{7}$: the upper number is called the numerator, from which the fraction takes the value: the lower is called the Denominator, and from it, it takes the decreaſe or diminiſhment. So the 7 in this fraction, breakes an unite into ſevē parts: the 3 above, ſhews that the value of this fraction, is three of thoſe ſeven parts, or three ſeventhes. So the greater the numerator is, the more is the value of the fraction, and the greater the denominator is, the leſſe is the value of the fraction, and no fraction (being a proper fraction) is ſo great as one unite; but an improper fraction may containe an unite, or many unites. It is an improper fraction, and containeth an unite, when the numerator and the denominator are alike, as $\frac{2}{2}$ $\frac{15}{15}$ and the like; it is alſo an improper fraction, when the numerator is greater then the denominator, as $\frac{15}{5}$ $\frac{20}{6}$, whereof the one contains three unites, the other 3 unites, and $\frac{2}{6}$, or $\frac{1}{3}$ of an unite: the value of theſe improper fractions is found by dividing the numerator by the denominator, and that I conceive to be the whole office of diviſion, for every number that is to be divided by another leſſe then it ſelfe, is an improper

per fraction, the dividend being the numerator, and the diviſor being the denominator, and the office of diviſion is to find how many unites and parts of an unite it containes: And ſo by fetching out all the unites, it leaves the remainder (if there be any) a proper fraction. There are alſo fractions which be parts of other fractions, called fractions of fractions, as thus, $\frac{1}{2}$ of $\frac{1}{3}$: that is, one halfe of one third. Or thus, $\frac{3}{5}$ of $\frac{4}{9}$ of $\frac{13}{24}$: that is, three fifts of foure ninths of thirteene twenty fourths of one unite &c. The bringing of theſe into one fraction is done by multiplying the numerators each by other, and ſetting that product for the new numerator, alſo multiplying the denominators each into other, & ſetting that prod. for the new denominator, as in theſe laſt: 4 by 3 is 12, and 13 by 12 is 156, this is the new numerator; alſo 9 by 5 is 45, and 45 by 24 is 1080: this is the denominator, and the reduced fraction is $\frac{156}{1080}$. Now foraſmuch as Addition and Subtraction cannot be fully taught without the knowledge of reducing fractions of different denominations into one denomination, I will firſt teach to doe that, which is thus: Multiply all the denominators each into other, as is formerly taught, that product muſt be the new and common denominator to all the fractions that are to be added together, then if there be but 2 fractions to be added together, multiply the numerator of the

firſt by the denominator of the ſecond, and that product is the numerator to the firſt fraction. Likewiſe the numerator of the ſecond multiplyed by the denominator of the firſt, gives the numerator to the ſecond fraction: And when they are thus brought both into 1 denominatiõ, then for addition there is no more to do, but to add both thoſe new numer. together, ſetting that totall over that new denom. & ſo the work is done: thus $\frac{5}{13}$ to be added to $\frac{9}{16}$, the denominators multiplyed together make 208, then 16 by 5 makes 80: & 13 by 9 makes 117: ſo the 2 reduced fractions ſtand thus, $\frac{80}{208}$ and $\frac{117}{208}$: and being added together they make $\frac{197}{208}$: or the leſſer being ſubtracted from the greater leaves $\frac{37}{208}$. So much for addition of two fractions together, and for the ſubtracting one fraction from another, which when the denominators doe differ, cannot be done (you ſee) without this reduction. Now if there be divers fractions to be added together, or divers fractions to be ſubtracted from one fraction, they muſt be all brought into one denomination after the manner aforeſaid, ſetting downe that common denominator found by multiplying each into other, as oft as you have fractions to be added, and alſo for that out of which you would ſubtract, and then multiply each numerator into each denominator (ſaving his owne) and that product place inſtead of that numerator, and then adding the numerators of thoſe that are to

be ſubtracted, take that totall from the numerator of that from whence they are to be ſubtracted, thus, $\frac{2}{9}$ and $\frac{3}{11}$ and $\frac{5}{19}$ to be ſubtracted from $\frac{24}{27}$. 11 multiplyed by 9 is 99, and 99 by 19 is 1881, and 1881 by 27 is 50787, this number is the common denominator to all the foure fractions, then to find them numerators, 11 multiplyed by 2 is 22, and 22 by 19 is 418, and 418 by 27 is 11286, this is numerator to the firſt, and ſtands thus, $\frac{11286}{50787}$ inſtead of $\frac{2}{9}$. Then 9 by 3 is 27, and 27 by 19 is 513. and 513 by 27 is 13851: ſo the ſecond is $\frac{13851}{50787}$ inſtead of $\frac{3}{11}$, then 5 by 9 is 45, and 45 by 11 is 495, and 495 by 27 is 13365, ſo the third is $\frac{13365}{50787}$ inſtead of $\frac{5}{19}$: and theſe three being added together, doe make $\frac{38502}{50787}$: then for the fourth, from which this is to be ſubtracted, 24 by 9 is 216, and 216 by 11 is 2376, and 2376 by 19 is 45144, ſo the ſaid fourth fraction is $\frac{45144}{50787}$ inſtead of $\frac{24}{27}$: then taking 38502 frō 45144, there reſteth 6642, which ſhews that $\frac{2}{9}$ and $\frac{3}{11}$ and $\frac{5}{19}$ being ſubtracted from $\frac{24}{27}$, the remainder is $\frac{6642}{50787}$. So much for addition and ſubtraction of fractions.

Multiplication and diviſion are more eaſie, for multiplication of 2 or more fractions together, is none other but as I have taught for the reducing of fractions of fractions into one ſimple fraction, which you know is done onely by multiplying the numerators together, and ſetting that

pro-

product for the new numerator, and likewiſe multiplying all the denominators together, and ſetting that product for the new denominator as there is taught, ſo $\frac{2}{3}$ multiplyed by $\frac{5}{8}$ makes $\frac{10}{24}$, which is leſſe then it was before, for $\frac{2}{5}$ is $\frac{16}{24}$: nor need you marvell at this, for if the multiplying by one give no increaſe, then multiplying by leſſe then one, muſt needs diminiſh, So much for multiplication.

Diviſion is performed only by multiplication, thus, Set downe that fraction which is your dividend firſt, and after it, that which is your diviſor, then multiply the denominator of the ſecond which is the diviſor, by the numerator of the firſt which is the dividend, and that product is the numerator to the new fraction which is the quotient, then multiply the denominator of the firſt by the numerator of the ſecond, and that product is the denominator to the ſaid new fraction, as thus, $\frac{5}{6}$ by $\frac{2}{5}$, 5 times 5 is 25, this is the new numerator, then 2 times 6 is 12, this is the new denominator: and ſo the quotient reſulting from this diviſion is $\frac{25}{12}$: ſo (which may ſeeme ſtrange) $\frac{5}{6}$ which is leſſe then one, being divided by $\frac{2}{5}$ is increaſed to $\frac{25}{12}$, that is, 2 unites, and $\frac{1}{12}$ of one unite, but this is to be underſtood otherwiſe: namely, as in diviſion in whole numbers, the quotient ſhews how oft the diviſor is contained in the dividend, as 12 divided by 4, the quotient being

being 3, ſhews that 4 is thrice contained in 12, likewiſe 12 divided by 5, the quotient being $2\frac{2}{5}$ doth ſhew that 5 is contained in 12 twice, and $\frac{2}{5}$ of once more, ſo this fraction $\frac{5}{6}$ being divided by $\frac{2}{5}$ the quotient being (as appeares) $2\frac{1}{12}$ doth ſhew that $\frac{2}{5}$ is contained in $\frac{5}{6}$ twice, and $\frac{1}{12}$ of once more. And that it doth ſo, I will make it plaine, by ſuppoſing this unite whereof theſe fractions are parts, to be 20^s or one pound, whereof $\frac{5}{6}$ is $16^s\ 8^d$, and $\frac{2}{5}$ is 8^s, now that $16^s\ 8^d$ doth containe 8^s twice, and $\frac{1}{12}$ of once more, it is plaine, ſeeing twice 8^s is 16^s, and $\frac{1}{12}$ of 8^s is 8^d, both, $16^s\ 8^d$. And ſo much for Addition, Subtraction, Multiplication, and Diviſion in fractions. I have alſo ſhewed 3 ſorts of reduction of fractions, that is to ſay, the reducing of fractions of fractions into one fraction, the reducing of improper fractions into their unites and proper fractions, and the reducing of fractions of differing denominations into one and the ſame denomination. Now there are more ſorts of reductions of fractions, as the reducing of a mixt number, which is a whole number and fraction together, into an improper fraction, which is done by multiplying the whole number by the denominator of the fraction, then adding to that product, the numerator of the ſaid fraction, that totall is the new numerator to the firſt denominator, thus, $15\frac{2}{13}$ is turned into an improper fraction by multiplying 15 by 13,

which

which makes 195, and with 7 the numerator added thereūto it makes 202 for the numerator to 13, and the improper fraction is $\frac{202}{13}$. Alſo, for ſuiting with other fractions, ſometimes there is occaſion to turne a whole number into a fraction, which is done only by multiplying the whole number by the denominator of that fraction, with which you would have it to accord, and that product is numerator to the new created improper fraction, and the denominator is the ſame with the other, as 12 turned into a fraction that ſhould be of the ſame denomination with $\frac{2}{5}$ is $\frac{60}{5}$. There is alſo a reduction of fractions into other denominations, the better to be underſtood, as $\frac{4}{7}$ of one ſhilling, the value will be better knowne if it be reduced into twelfths, ſeeing $\frac{1}{12}$ of 1^s is 1^d, to turne it into twelfths, is thus, ſeeing it is to be turned into twelfths, therefore 12 muſt bee multiplyed by 4, the numerator of this fraction, which gives 48, which 48 muſt be divided by 7, the denominator now rejected, which gives for quotient $6\frac{6}{7}$ for numerator to twelve, ſo the new fraction is $\frac{67}{12}$, and $\frac{6}{7}$ of $\frac{1}{12}$ of one ſhilling, that is, 6^d, and $\frac{6}{7}$ of $\frac{1}{12}$ of 1^s, or $\frac{6}{7}$ of 1^d. But for the finding the value of fractions that import coin, whether ſhillings or pounds, neare enough to exactneſſe, take this obſervation of mine, If it import ſhillings, put a cipher to the numerator, then divide it by the denominator: that quotient ſhews

how

how many tenths of 1ˢ the fraction containeth, now you know the tenth of 1ˢ is $1^{d}\frac{1}{5}$: ſo for this $\frac{4}{7}$ of 1ˢ, putting a cipher to the 4, it is 40, wherein 7 is found 5 times, and 5 remains, which ſhews that this fraction containes $\frac{5}{10}$ of 1ˢ, and $\frac{5}{7}$ of $\frac{1}{10}$. Now ſeeing every tenth is $1\frac{1}{5}^{d}$, then $\frac{5}{10}$ is 6^{d}: ſo it is eaſily found to be in value 6^{d}, and $\frac{5}{7}$ of $1\frac{1}{5}^{d}$. If it be a fraction that is part of 1^{li}, then put 2 ciphers to the numerator, and then dividing it by the denominator, that quotient ſhews how many $\frac{1}{100}$ parts of 1^{li} the fraction containes: Now every $\frac{1}{100}$ part of 1^{li} is $2\frac{2}{5}^{d}$, and if you double that quotient, and then ſtrike off one figure, every unite in that figure ſtruck off, doth betoken $1\frac{1}{5}^{d}$, the reſt of the ſaid quotient are ſhillings, for example, $\frac{34}{256}$ of 1^{li}, putting 2 ciphers to 34, it makes 3400, which divided by 256, the quotient is $13\frac{72}{256}$: wᶜʰ being doubled, both whole nũber & fraction, it makes $2|6\frac{144}{256}$: ſo ſtriking off the 6, that 6 betokeneth 6^{d}, and $\frac{6}{5}$ of 1^{d}, which is $7^{d}\frac{1}{5}$: the 2 ſeparated with a ſtroke of the pen from the ſaid 6, betokeneth 2^{s}: ſo this fraction $\frac{34}{256}$ of 1^{li}, is thus found to be in value $2^{s}\,7^{d}\frac{1}{5}$ and $\frac{144}{256}$ of $1\frac{1}{5}^{d}$.

Or if you will goe the other way, then multiply the ſaid numerator 34 by 240 the pence in one pound, it makes 8160, which divided by the denominator 256, the quotient is $31^{d}\frac{224}{256}$, ſhewing, that the ſaid fraction is in value 31^{d}, and $\frac{224}{256}$ of 1^{d}, which is $2^{s}\,7^{d}$, $\frac{224}{256}$ of 1^{d}, which agrees

agrees with the former worke which is $2^s\ 7\frac{1}{5}^d$ and $\frac{144}{256}$ of $1\frac{1}{5}^d$: but becauſe it is not eaſily diſcerned that theſe two doe juſtly agree, it will not be amiſſe to make it appeare; which may be a direction for the like occaſions. It is done thus, Firſt, I reduce the $1\frac{1}{5}^d$ into an improper fraction, ſo is it $\frac{6}{5}$, then this $\frac{144}{256}$ of $\frac{6}{5}$ I reduce to one fraction by the rule aforeſaid, and find it $\frac{864}{1280}$, whereunto I add the $\frac{1}{5}$ that ſtands with the 7^d, firſt reducing them to one denomination, ſo are they $\frac{4320}{6400}$ and $\frac{1280}{6400}$, then by adding the numerators together, I find they make $\frac{5600}{6400}$, and cutting off the 2 ciphers from each, the fraction is ſo brought into a ſmaller terme, viz. $\frac{56}{64}$, now this fraction betokeneth $\frac{56}{64}$ of 1^d, and is inſtead of $\frac{1}{5}$ of 1^d, and $\frac{144}{256}$ of $1\frac{1}{5}^d$. And now the triall is to ſee whether this fraction $\frac{56}{64}$ be equall to $\frac{224}{256}$ which is the fraction in the ſecond worke, and the tryall is made by dividing the one by the other, For (as I ſaid before) diviſion doth ſhew what proportion one fraction beareth to another, and if they be both equall, then the new fraction which is the quotient, will have the numerator and denominator both alike, and will ſeeme to repreſent an unite, now if I divide $\frac{56}{64}$ by $\frac{224}{256}$, the quotient (working as I have formerly taught) is $\frac{14336}{14336}$, and ſo the 2 workes doe appeare to agree. And the proſecuting of this tryall hath produced good directions for ſuch as ſhall have to doe with fractions, and

is worth obſerving, For without theſe directions, this queſtion might have poſed a reaſonable good Arithmetitian, if he ſhould have beene aſked, what is the proportion betweene $\frac{1}{5}$ of 1^d, and $\frac{144}{256}$ of $1\frac{1}{5}d$, and $\frac{224}{256}$ of 1^d, which here is found to be as 14336 is to 14336, that is, both equall in proportion, and both of one value.

There is yet another ſort of reduction, which is the bringing of fractions into their ſmalleſt termes, whereby their value may be more eaſily diſcerned, for many fractions fall out in work to be writ in high and great termes, that may be expreſt in lower and ſmaller termes, though ſome will not admit of any abridgement in the exact expreſſure of their juſt value, though they be writ in high termes, ſuch is $\frac{347}{2198}$ and divers others. Now for the reducing of ſuch fractions into their ſmalleſt termes as will thereof admit, Firſt, for ſuch as are writ with ciphers, you may ſtrike them off, ſo that you ſtrike off as many from one number, as from another, thus, $\frac{5700}{9800}$: by ſtriking off the ciphers this is made $\frac{57}{98}$, and $\frac{1005}{1770}$ is made $\frac{105}{177}$: now theſe 2 ciphers cannot be rejected, becauſe they do not ſtand both in one place, but $\frac{101}{1807}$ by rejecting the ciphers, is made $\frac{35}{177}$, and ſo for the like. Likewiſe for ſuch fractions where both the numbers will be equally parted into halves, thirds, fourths, fifts &c. you may accordingly abridge them thus, $\frac{18}{26}$ is made $\frac{9}{13}$, $\frac{27}{39}$ is alſo

made

bmade $\frac{2}{13}$, and $\frac{2}{15}$ is made $\frac{1}{7}$, $\frac{28}{38}$ is made $\frac{7}{19}$, $\frac{35}{50}$ is made $\frac{7}{10}$ and the like. But if they be in ſuch termes that you cannot diſcerne what number will equally divide both the termes, then the rule is to divide the greater terme by the leſſer: If any thing remaine, by that remainder divide the laſt diviſor (not regarding the quotient) and ſo proceed till you find ſuch a diviſor as doth juſtly divide his dividend, and leave no remainder, then divide both the termes of the fraction by that laſt diviſor, and ſo it is brought into the ſmalleſt termes; but if you find no diviſor that doth juſtly divide his dividend, till the remainder is only one, then, becauſe one divideth not, therefore it appeares, that fraction is already in the loweſt termes that it can be brought into. Examples for both, and firſt for $\frac{34}{8}\frac{7}{398}$ which is already in the ſmalleſt termes, dividing 2596 by 347 (not regarding the quotient which is 7) the remainder is 167, by which dividing 347 (the laſt diviſor) the remainder is 12, by which dividing 167, the remainder is 11, by which dividing 12, the remainder is 1, and this ſhews that this fraction will not admit of any abridgement, yet for this and the like, it may be ſome advãtage for the nearer diſcerning of their value, to turne them into tenths, hundreths, or thouſand parts, which is done by putting to one, two, or three ciphers, ſo by putting one cipher to this numerator, it is made $\frac{340}{1000}$:

wherein the denominator is found once, and 874 remaines, which ſhew that this fraction is in value $\frac{1}{10}$, and $\frac{874}{2596}$ of $\frac{1}{10}$: and putting 2 ciphers to it, it is ſo made $\frac{34700}{2596}$: then dividing the numerator by the denominator, the quotient is 13: 952 remaining, which ſhews that $\frac{347}{2596}$ is in value $\frac{13}{100}$, and $\frac{952}{2596}$ of $\frac{1}{100}$. And then, knowing that $12\frac{1}{2}$ is $\frac{1}{8}$ of 100, therefore this fraction $\frac{13}{100}$ is in value ſomewhat more then $\frac{1}{8}$ of an unite. And now for ſuch as will kindly admit of abridgement, and firſt, taking this fraction $\frac{126}{351}$, dividing 351 by 126, reſteth 99, by which dividing 126, reſteth 27, by which dividing 99, reſteth 18, by which dividing 27, reſteth 9, by which dividing 18, reſteth 0. So hereby I find that this laſt diviſor which is 9, will equally divide both the numerator and denominator of the ſaid fraction, therefore dividing 126 by 9, the quotient is 14, likewiſe dividing 351 by 9, the quotient is 39: ſo this fraction $\frac{126}{351}$ is by this meanes reduced into $\frac{14}{39}$ which is the ſmalleſt termes of this fraction.

So if I would abreviate $\frac{279}{837}$, I muſt divide 837 by 279, and I find it doth juſtly divide it and nothing reſts. Now in this caſe the quotient being 3, is not to be rejected, but to be ſet for the denominator of the new fraction, and then dividing 279 by it ſelfe, the quotient muſt needs be 1, which is to be ſet for numerator to the new fraction, which is now $\frac{1}{3}$ inſtead of $\frac{279}{837}$. There needeth

deth no more examples for this kind of reduction, only you may obſerve this, that whatſoever the termes of a fraction be, if the laſt writ figure in each of the termes be an even figure, then both the termes are even numbers, and will therefore be equally halved once, and ſometimes twice or more. As for example, $\frac{376}{592}$ is firſt made $\frac{188}{296}$, and being halved againe is made $\frac{94}{148}$, and againe (ſeeing both the laſt figures are yet even) and ſo it is brought to $\frac{47}{74}$, each term being thus divided by 8. Now for multiplying of a fraction by a whole number, it is done either by multiplying the numerator of the fraction by the whole number, or elſe (if you ſee it will be aptly done) by dividing the denominator of the fraction, by the whole number. For example, $\frac{13}{16}$ being to be multiplyed by 4, is either made $\frac{52}{16}$ by multiplying the numerator, or elſe it may be made $\frac{13}{4}$ by dividing the denominator, both which are one, but in this caſe it is beſt to be done by diviſion, becauſe that way leaves the fraction in the leaſt tearmes, but when the denominator cannot be juſtly divided, then it muſt be done by multiplying of the numerator.

The dividing of a whole number by a fraction is done by multiplying the whole number, and the denominator of the fraction together, and ſetting that product for the numerator of the new fraction, whoſe denominator muſt be the

numerator of the old fraction, thus, 8 being divided by $\frac{3}{4}$ is made $\frac{32}{3}$: 15 divided by $\frac{2}{5}$ is made $\frac{75}{2}$, or rather the quotient is $\frac{75}{2}$, ſhewing that 15 intire unites, doth containe $\frac{3}{5}$ of an unite 37 times and an halfe, and that it is ſo, I will make plaine by this familiar example, ſuppoſe theſe 15 unites are 15^{li}: $\frac{3}{5}$ of one of theſe unites is 8^{s}, which 8^{s} being taken 37 times and an halfe, doth make juſt theſe 15 unites or 15^{li}.

Now for the dividing of a fraction by a whole number, it is done after the ſame manner as I taught to multiply a fraction by a whole number, only reverſing the order, thus, That whereas there you are either to multiply the numerator or divide the denominator, here you muſt either multiply the denominator or divide the numerator, if it will be evenly done, thus, $\frac{1}{3}$ divided by 7, the quotient is $\frac{1}{21}$, ſhewing, that $\frac{1}{3}$ of an unite is but the $\frac{1}{21}$ part of 7 unites; and $\frac{12}{17}$ divided by 4, the quotient is $\frac{3}{17}$, for as much as 4 is found three times in 12, and ſhews that $\frac{12}{17}$ of 1 unite is equall to $\frac{3}{1}$ of 4 unites.

And now that I have thus farre ſtrayed beyond the bounds of my intent, I muſt not be ſo abrupt, as to breake off this buſineſſe before I have ſomewhat ſhewed the manner of orderly working by the golden Rule in fractions,
And firſt, for this rule direct.

All your three numbers being fractions, the numerator

merator of the firſt fraction (being orderly placed according to my forme directions in whole numbers) muſt be multiplyed by the denominator of the ſecond fraction, and that product by the denominator of the third, and that product is the diviſor; then multiply the denominator of the firſt by the numerator of the ſecond, and that product by the denominator of the third, and that product is the dividend, which being divided by the former diviſor, the quotient gives the anſwer. For example, If $\frac{5}{8}$ giue $\frac{7}{9}$, what ſhall $\frac{11}{15}$ give? 9 multiplyed by 5 is 45, and 45 by 15 is 675, then 8 by 7 is 56, and 56 by 11 is 616: this is the dividend, which being leſſe then the diviſor, it is alſo a fractiō being $\frac{616}{675}$, and ſhews that if $\frac{5}{8}$ give $\frac{7}{9}$, then $\frac{11}{15}$ will give $\frac{616}{675}$, or that $\frac{616}{675}$ doth beare the ſame proportion to $\frac{11}{15}$, that $\frac{7}{9}$ beareth to $\frac{5}{8}$. Now I thinke it were not amiſſe to ſhew how to try whether theſe two proportions do agree, which to doe, firſt find the proportion betweene $\frac{7}{9}$ and $\frac{5}{8}$ by dividing $\frac{7}{9}$ by $\frac{5}{8}$, ſo it will appeare (the quotient being $\frac{56}{45}$) that $\frac{7}{9}$ is to $\frac{5}{8}$ as 56 is to 45; And by the ſame way it wil be found that $\frac{616}{675}$ is to $\frac{11}{15}$, as 9240 is to 7425. Now whether theſe 2 proportions doe agree or not, the golden Rule will decide, by ſaying, if 45 the numerator, give 56 for denominator, then what denominator will 7425 give? by multiplying and dividing, it will be found to give 9240, which is the ſame that is here preſen-

numerator of the old fraction, thus, 8 being divided by $\frac{3}{4}$ is made $\frac{32}{3}$: 15 divided by $\frac{2}{5}$ is made $\frac{75}{2}$, or rather the quotient is $\frac{75}{2}$, ſhewing that 15 intire unites, doth containe $\frac{3}{5}$ of an unite 37 times and an halfe, and that it is ſo, I will make plaine by this familiar example, ſuppoſe theſe 15 unites are 15^{li}: $\frac{3}{5}$ of one of theſe unites is 8^{s}, which 8^{s} being taken 37 times and an halfe, doth make juſt theſe 15 unites or 15^{li}.

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All your three numbers being fractions, the numerator

merator of the firſt fraction (being orderly placed according to my forme directions in whole numbers) muſt be multiplyed by the denominator of the ſecond fraction, and that product by the denominator of the third, and that product is the diviſor; then multiply the denominator of the firſt by the numerator of the ſecond, and that product by the denominator of the third, and that product is the dividend, which being divided by the former diviſor, the quotient gives the anſwer. For example, If $\frac{5}{8}$ giue $\frac{7}{9}$, what ſhall $\frac{11}{15}$ give? 9 multiplyed by 5 is 45, and 45 by 15 is 675, then 8 by 7 is 56, and 56 by 11 is 616: this is the dividend, which being leſſe then the diviſor, it is alſo a fractiõ being $\frac{616}{675}$, and ſhews that if $\frac{5}{8}$ give $\frac{7}{9}$, then $\frac{11}{15}$ will give $\frac{616}{675}$, or that $\frac{616}{675}$ doth beare the ſame proportion to $\frac{11}{15}$, that $\frac{7}{9}$ beareth to $\frac{5}{8}$. Now I thinke it were not amiſſe to ſhew how to try whether theſe two proportions do agree, which to doe, firſt find the proportion betweene $\frac{7}{9}$ and $\frac{5}{8}$ by dividing $\frac{7}{9}$ by $\frac{5}{8}$, ſo it will appeare (the quotient being $\frac{56}{45}$) that $\frac{7}{9}$ is to $\frac{5}{8}$ as 56 is to 45: And by the ſame way it wil be found that $\frac{616}{675}$ is to $\frac{11}{15}$, as 9240 is to 7425. Now whether theſe 2 proportions doe agree or not, the golden Rule will decide, by ſaying, if 45 the numerator, give 56 for denominator, then what denominator will 7425 give? by multiplying and dividing, it will be found to give 9240, which is the ſame that is here preſen-

ted, and ſo ſhews theſe two proportions to be equall.

If $3\frac{1}{2}$ ells of taffetie coſt $36^{s}\ 8^{d}$, which is $1\frac{5}{6}{}^{li}$, what ſhall $1\ 5\ \frac{3}{4}$ ells coſt? Turne theſe three mixt numbers into improper fractions, ſo are they to be placed thus, If $\frac{7}{2}$ coſt $\frac{11}{6}$, what ſhall $\frac{63}{4}$ coſt? multiply the numerator of the firſt by the denominator of the ſecond, and that by the denominator of the third, and that product being 168, is the diviſor; then multiply the denominator of the firſt by the numerator of the ſecond, and that by the numerator of the third, and that product being 1386 is the dividend, which divided by 168, the quotient is $8\frac{42}{168}$, ſhewing that the price of $1\ 5\frac{1}{4}$ ells at this rate, will be $8\frac{42}{168}{}^{li}$, that is, 8^{li}, and $\frac{42}{168}$ parts of 1^{li}. Now in this fraction it may eaſily be obſerved, that the numerator will evenly divide the denominator, being found in it foure times, ſo that $\frac{42}{168}$ is all one with $\frac{1}{4}$: and ſo the anſwer is 8^{li} and $\frac{1}{4}$, or $8^{li}\ 5_{s}$ for the price of the $1\ 5\frac{1}{4}$ ells of taffetie.

Againe, briefly for tryall, If $8\frac{1}{4}$ buy $1\ 5\frac{1}{4}$, what $1\frac{5}{6}$, Theſe being reduced ſtand thus, If $\frac{33}{4}$ buy $\frac{63}{4}$, what $\frac{11}{6}$, working as is taught, the diviſor will be found to be 792, and the dividend 2772, which divided by 792, the quotient is $3\frac{396}{792}$, and ſeeing this numerator is juſt one halfe of the denominator, therefore this fraction in the ſmalleſt termes is $\frac{1}{2}$, ſo the anſwer is $3\frac{1}{2}$ confirming the former worke.

worke. Againe, if $15\frac{3}{4}$ coſt $8\frac{1}{4}$, what $3\frac{1}{2}$? Theſe reduced ſtand thus, $\frac{63}{4}$ $\frac{33}{4}$ $\frac{7}{2}$, ſo working as is taught, the diviſor will be found to be 504, and the dividend 924, in which the diviſor is found once, and the remainder is 420: ſhewing that $3\frac{1}{2}$ will coſt $1\frac{420}{504}$; now dividing this denominator by the numerator, the quotient is 1, and 84 remaines, by which 84 dividing the former diviſor, which is the numerator of the fraction, the quotient is 5, and nothing remaines, therefore this 5 muſt be numerator to the new fraction, and then dividing the denominator of the ſaid fraction by the ſaid 84, the quotient is 6, ſo $\frac{420}{504}$ being reduced to the ſmalleſt termes, is $\frac{5}{6}$, and ſo the quotient anſwering the queſtion is $1\frac{5}{6}$: ſo theſe three workes are each confirmed by other.

You may alſo if you pleaſe, turn fractions that are to be applyed to the golden rule, into whole numbers, and then worke by the rule after they are in whole numbers, which is done thus, the firſt whole number which is to be the diviſor, is found after the ſame manner as in theſe former workes the denominator of the new fraction, (which there alſo is the diviſor,) is found, ſo that taking this laſt queſtion; the firſt whole number for the golden rule wil be 504, the ſecond whole number muſt be only the numerator of the ſecond fracrion, which in this laſt queſtion (you may ſee) is 33, and the third whole number muſt

be the product that ariſeth by multiplying the denominator of the firſt, and the numerator of the third together, which in this laſt queſtion being 4 and 7, their product is 28: ſo the whole numbers will ſtand thus, If 504 give 33, what will 28 give? now you muſt know, that in the rule of 3 direct, the ſecond and third numbers are to be multiplyed together, and that product divided by the firſt number; ſo here, 28 being multiplyed by 33, the product is 924, which is the ſame dividend that was in the former work, and ſo it muſt be, or elſe having the ſame diviſor, it cannot give the ſame quotient, but being the ſame dividend and ſame diviſor here as is there, there muſt needs be the ſame quotient: ſo this worke need not be proſecuted any further, you ſee the manner to worke both waies, and may uſe which you pleaſe.

Now one queſtion to ſhew the working by the backer rule, & ſo I have done. How many pound of ſuckets at $2\frac{1}{4}$ ſ muſt be given for $194\frac{1}{4}$ pound of pepper at $1\frac{1}{3}$ ſ by the pound? theſe mixt numbers muſt be reduced into improper fractions, and then being orderly placed, will ſtand thus, If $\frac{4}{3}$ require $\frac{777}{4}$ what will $\frac{9}{4}$ require? now in this worke the numerator of the firſt muſt be multiplyed by the numerator of the ſecond, and that by the denominator of the third, and that product is the dividend; likewiſe the denominator

of

of the first by the denominator of the second, and that by the numerator of the third, and that product is the divisor, which being here performed accordingly, the dividend will be found to be 12431, and the divisor 108, and the quotient which this division bringeth forth, which answereth the question, is $115\frac{11}{108}$, which in smallest termes is $115\frac{1}{9}$, and so many pounds of suckets are to be delivered for the said $194\frac{1}{4}$ pound of pepper. And so much for this Treatise touching fractions.

The Rule of Proportion: or, The Rule of three, called, *The Golden Rule.*

THis rule is either direct or converst, the propertie of it is, by three numbers given to find a fourth number, so far extended, and so limited by true proportion, that it can neither fall short, nor exceed the true number answering to the question propounded; In the rule direct, the number sought, beareth the same proportion to the third, that the second beareth to the first.

Example,

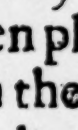
If 30li gaine 5li, what shall 120li gaine after that rate?

The

The chiefe point of this rule, is to give the given numbers their right places or precedencie, as the queſtion doth require; which is, to make that the firſt, from which the queſtion riſeth, being that which followeth the word, *If*: the ſecond muſt be that which the firſt produceth, and muſt be of the ſame denomination and nature that the fourth number which anſwereth the queſtion will be of, when it is found; and the third muſt bee that whereupon the queſtion is grounded, being that which followeth the word *What*, and muſt be of the ſame denomination that the firſt is of: all theſe points muſt be obſerved, or elſe errors may grow, ſo this queſtion being rightly brought to the rule, will be thus, If 30^{li} ſtock give 5^{li} gains, what ſhall 120^{li} ſtock give? And not thus, If 5^{li} gains come of 30^{li} ſtock, what ſhall come of 120^{li} ſtock; this way may deceive, becauſe they ſeeme to be orderly placed, ſeeing the two numbers doe orderly enough follow the two words, If and What, but yet they faile in the other point, for here the firſt number is of the nature of the number ſought, to wit, Gaines, and the ſecond is of the nature of the third, to wit, Stock, which is contrary to my rule preſcribed.

Now the rule it ſelfe is this, The numbers being orderly placed as aforeſaid, the ſecond and third muſt be multiplyed together, and that product

duct muſt be divided by the firſt, the quotient gives the anſwer.

You may (if you pleaſe) make ſuch a figure or character,  and then place your numbers the firſt at the head on the left hand, the ſecond at the head on the right hand, and the third at the foot on the left hand, leaving the ſpace at the foot on the right hand, for the fourth number, when it ſhall be found, thus,

30 | 5
120 |

Then multiply croſſewiſe that at the foot on the right hand, by that at the head on the left hand, thus,

120 . 5
600

this product being 600 divide by 30: or rather 60 by 3, leaving out a cipher from each of them, and ſo the quotient is preſently found to be 20, ſhewing that 20li will be the gaines of 120li after that rate.

600	60
000	(20

Now in this queſtion, and in ſuch caſes as this, when the third number may be divided by the firſt, leaving no remainder, it will be ſomewhat the nearer way to doe ſo, and then by that quotient to multiply the ſecond number: ſo in this, 120 being divided by 30, the quotient is 4; by which multiplying 5 my ſecond number, the pro-

product is 20 as aforesaid. Likewise, if the second number will so divide the first as to leave no remainder, then by that quotient divide the third number, and that second quotient gives the answer. As here, 30 being divided by 5, the quotient is 6, by which 6 dividing 120, the quotient is 20 as aforesaid.

And this doth necessarily follow from that which I said, that there is the same proportion between the third number and the fourth, which is the number sought, that is, betweene the first and the second, that is, looke how oft the first number containeth the second, so oft, the third number containeth the fourth which is sought: and againe, as oft as the first number is contained in the second, so oft the third number is contained in the fourth, which is that that is sought. And in this case, you may divide the second number by the first (if it will evenly doe it) and by that Quotient multiply the third number, the product is the answer or fourth number sought, As in this question taken as I shewed, how the numbers may be placed wrong, being rectified by only altering 1 of the denominations, which then standeth thus. If 5^{li} gaines come of 30^{li} stock, of what stock commeth 120^{li} gaines? Here (because it will justly doe it) I divide 30, the second, by 5, the first) the quotient is 6, by which I multiply 120, the third number, and the product

is

is 720, and this is the fourth number ſought, which containes 120 as oft as 30 containes 5, and ſheweth that 720li is the true ſumme that muſt gaine 120li according to the rate of 30 pound gaining 5 pound. Thus much for the explanation of this rule direct.

If two partners make a ſtock of 240li, and this ſtock gaine 45li, what part of this gaines will fall to his ſhare, that put in 150li to that ſtock?

Now you muſt ſay, If 240li ſtock give 45li gaines, what gaines doth 150 ſtock give?

Here, you muſt multiply the third by the ſecond, and divide that product by the firſt, and the quotient gives the anſwer, thus,

150 : 45
300
750
6750

So adding together theſe three numbers, and doubling the higheſt, the product is 6750, which is to be divided by 240, but (rejecting the two ciphers) I only divide 675 by 24 thus,

675	: 24	This quotient being
48	48	28li, and $\frac{1}{24}$ which is
195	72	$\frac{1}{8}$, doth ſhew that
192	96	hee that put in 150li
3	120	ſtock, is to have 28li
	$28\frac{1}{24}$	02s 06d of the gains.

Another

Another queſtion for proofe.

If 28li 02s 06d be the gaines of 150li, what is the gaines of 240li?

It will be beſt to bring the gaines into one denomination, and ſo it makes 6750d. Theſe numbers muſt not be brought to the rule, as they are here propounded, but thus, If 150li gaine 6750d, what ſhall 240li gaine? ſo 6750 is to be multiplyed by 240, thus,

6750 . 240
27000
1620000

This product being 1620000 muſt be divided by 150, thus, rejecting one cipher in each.

162000 . 15
32400
10800

And ſo leaving out one cipher in the dividend, as alſo the cipher in the diviſor, I only divide by 15, which (as I formerly taught) is done only by ſtriking off one figure, doubling the reſt, and then thirding it, ſo the Quotient is quickly found to be 10800d, which reduced, is 900s, that is, 45li, confirming the worke.

Foure neceſſarie queſtions, or rather one queſtion varied four ſeveral waies, which may well ſerve for direction for the bringing of any queſtion

ſtion to this rule of three, direct. The firſt is this.

If 24 yards or ells coſt 6^{li} 15^{s} 00^{d}, what ſhall 246 coſt? Here this ſecond number muſt bee brought into one denomination, which in ſhillings is 135^{s}, ſo 246 the third number is to bee multiplyed by 135 the ſecond, thus,

246 . 135
738
1230

33210 divde by 24

24	48
92	72
72	96
201	120
192	(1383 $\frac{18}{24}$
90	
72	
18	

So this Quotient being found to bee $1383^{s}\frac{18}{24}$ which is $\frac{3}{4}$, that is, 9^{d}, doth ſhew that 69^{li} 03^{s} 09^{d} will be the price of 246 yards at this rate.

If 246 yards coſt 69^{li} 03^{s} 09^{d}, what will 24 coſt? Here this ſecond number muſt be brought into pence, is 16605^{d}, which is moſt readily done thus,

1383
13839

16605 the higheſt doubled.

This number of pence muſt be multiplyed by

the third number which is 24, thus,

16605
33210
66420
398520

These additions thus performed by as wise, (the figures being orderly placed) are very easie, as appeares, and doe afford much advantage many times in worke. Now this product (as the rule teacheth) must be divided by 246, the first number, thus,

398520 . 246

246 | 492
1525 | 738
1476 | 984
492 | 1230
492 | (1620
0000

This Quotient shews, that 1620d will be the price of 24 yards at this rate: now 1629d is 135s, which is 6li 15s 00d, confirming both the workes.

If 69li 03s 09d which is 16605d buy 246 yards, what will 6li 15s 0d which is 1620d buy? here the third must be multiplyed by the second, thus,

1620 . 246

3240
6480
9720

398520 . 16605

33210 | 33210
66420 | 49815
66420 | 66420
00000 | 83025
(24

This Quotient shews that 6li 15s 0d will buy 24 yards at this rate.

If

If 24 yards be ſold for 1620^{d}, how many yards may be ſold for 16605^{d}? I have propounded this queſtion thus, though it is not as it ſhould be, becauſe it is uſuall to have queſtions thus diſorderly propounded, it is therefore the diſcretion of the workman, that muſt reduce them to order apt for the rule, and then, neither the two laſt numbers (as they are here) nor the two firſt, muſt be of one denomination. So this queſtion muſt be brought to the rule, thus, If 1620^{d} buy 24 yards, how many yards will 16605^{d} buy? This third number muſt be multiplyed by 24 the ſecond thus,

16605 . 24		The two ciphers may be rejected in this diviſion.
33210		
66420		
398520 .	162/0	This Quotient doth ſhew
324	324	that 16605^{d} being 69^{li} 03^{s}
745	486	09^{d} wil buy 246 yards at this
648	648	rate.
972	810	
972	(246	
000		

So the truth of each worke is confirmed by o-ther, and all of them doe ſufficiently direct for

the bringing of any queſtion to this rule, which is to be anſwered by it: And that is the reaſon that I have taken ſome paines to make plaine all the paſſages in anſwering theſe queſtions.

And now, if you doe but obſerve, with what little trouble theſe queſtions are reſolved, performing multiplication and diviſion my waies, I hope you cannot but take ſome notice by this little application of them to this buſineſſe, of the great convenience thereof, not only for learners, but alſo for practicers of this Art, and more I hope you will find by the ſequell; I think there needeth no more queſtions nor examples touching this rule of three direct, ſeeing (if need be) you may be further informed by the queſtions anſwered by this rule, in the other rules ſucceeding: And now ſomewhat touching this rule of three, as the worke is wrought another way, different from that way which is here taught; And this is called the backer rule, or rule of three converſt. And in this rule you muſt not multiply the ſecond and third together, and divide that product by the firſt, as is taught to doe in this rule direct; but here you muſt multiply the firſt and ſecond together, and divide that product by the laſt of the three numbers; for in this rule, looke what proportion is betweene the firſt and the third, the ſame proportion is betweene the fourth, which is the number ſought, and the ſecond:

cond: for an example take this, A certaine man lent his friend 230li for 7 moneths, and ſhortly after he borrowed of the ſame friend 300li; The queſtion is, how long he may keep it to recompence himſelf, and not incroach upon his friend.

This queſtion muſt be brought to the rule, thus, If 230li be lent for 7 moneths, or give 7 moneths, for what time muſt 300li be lent, or what time will 300li give? Now if the third number be multiplyed by the ſecoud, and that product divided by the firſt (according to the former rule direct) that will produce a longer time, but reaſon teacheth that the greater the ſumme is, the ſhorter ſhould be the time. Therefore here (as I formerly directed) the firſt muſt be multiplyed by the ſecond, and that product divided by the laſt, thus,

230 . 7
1150

This quotient ſhews, that he	161/0 .	by 30/0
may keep the 300li 5 months	150	60
and 11/30, which after 30 daies		90
to the moneth, is 5 moneths	11	120
and 11 daies.		150
		(5 11/30

If 300li be lent for 5 moneths and 11 daies, which after 30 daies to the moneth is 161 daies, how much money muſt be lent for 7 moneths

which is 210 daies, to countervaile this curtesie? It is best brought to the rule, thus, If 161 require 300li, what will 210 require?

	300 .	161
	1800	
	300	
This quotient shews, that 230li is the summe to be lent.	4830|0 .	21|0
	42	42
	63	63
	63	84
	000	105
		(230

How many pounds of Barberie sugar at 16d a li must be delivered for 459li of Indico at 4s 5d a li? The price of the Indico must be brought into pence is 53d per li. Then say, If 53 require 459, what will 16 require?

	459 .	53
	918	
	2295	
This quotiēt presently shews, that 1520li $\frac{7}{16}$ which is 7 ounces, must be delivered for the said 459li of Indico.	24327 .	16
	16	32
	83	48
	80	64
	32	80
	32	(1520 $\frac{7}{16}$
	07	

If

If 1520 pound, and 7 ounces of Barberie ſugar at 16^{d} the pound be delivered for Indico at 53^{d} the pound, how much Indico muſt be received for it? This weight of the ſugar muſt be turned into ounces, thus,

1520 }
7600 } is 24327 ounces.
15207 }

This number muſt be mulitplyed by 16, which is the ſecond number, and that product divided by 53 (the laſt) thus,

24327 . 16
121635
24327

This quotient ſhews, that he ſhould receive for his 24327 ounces of ſugar, 7344 ounces of Indico, the prices of both being as aforeſaid

389232 . 53
371 106
159
182 212
159 265
233 (7344
212
212
212
000

Now theſe 7344 ounces reduced, is 459^{li} confirming the worke.

Or you may in ſuch caſes omit the multiplication of the ounces, and ſo the quotient will produce pounds, and ſave reduction.

One Goldſmith delivers to another, 40 ounces of polliſht Currall, at 7ˢ the ounce, to receive for the ſame old ſilver plate at 5ˢ an ounce; the queſtion is how much Plate he muſt receive. Say thus, If 7 give 40, what will 5 give? Now diſcretion will ſhew, that ſeeing the cheaper the Plate is, the more, and not the leſſe, muſt be delivered: therefore this eaſie queſtion muſt be anſwered by this backer rule, multiplying the ſecond by the firſt, and dividing that product by the third, thus,

```
 40 · 7
200
---
28|0 · 5
56|
```

This work you ſee, multiplying and dividing my way, is inſtantly done; the quotient ſhewing, that he muſt receive 56 ounces of plate for his 40 ounces of Corrall, the priſes of both being as aforeſaid.

If the carriage of 1 12ˡⁱ weight 45 miles coſt 2ˢ 4ᵈ, what will 346ˡⁱ weight coſt being carried 78 miles? This queſtion and the like may either be anſwered by this rule of three direct, at two workings, or elſe, at one working, by the compound rule, or rule of three compoſed of five numbers: I will ſhew you both.

If

If 112li coſt 28d, what 345 li?

346 . 28
2768
9688 . 112
896 224
728 336
672 448
56 560
(86 56/112

If 45 miles require 86½, what 78 mi.

78 . 85½
390
624
39
6747 . 45
45 90
135
224 180
180 225
447 (149 42/45
405
42

Here you ſee is two works, whereof the firſt ſhews that if 112li carriage doe coſt 28d, then the carriage of 346li will coſt 86½d. The ſecond worke ſhews that if the carriage 45 miles coſt 86½d, then the carriage 78 miles will coſt 149 42/45, which is almoſt 150d.

Now to doe this at one working by the compound rule, is thus, If the carriage of 112li 45 miles coſt 28d, what will 346li coſt being carried 78 miles?

The 5 nnmbers being thus rightly placed, the number being placed in the middle which is of the

the nature of the ſixt, which is the number ſought. Then the 2 firſt numbers muſt be multiplyed together, and that product muſt be the diviſor, thus,

45 . 112
45
90

5040

Then the three laſt numbers muſt be multiplyed together, and that product muſt be the dividend, thus,

346 . 78
1730
2768

26988 againe by 28
215904

755664 divide by 5040
5040

25166
20160

50064
45360

4704

10080
15120
20160
25200

(149 $\frac{4704}{5040}$

This quotient ſhewes, that 149^{d}, and $\frac{4704}{5040}$ parts of 1^{d}, will be the price of the cariage of 346^{li} 78 miles according to the rate propounded.

Now this fraction being brought into the loweſt termes, (which is done by dividing both the numerator and the denominator by 336) is $\frac{14}{15}$, and the ſame

alſo

alſo is the former fraction $\frac{42}{45}$ being brought into the loweſt termes by thirding each terme: ſo the works doe agree.

At 8 per centum per annum, what is the Intereſt of 660^{li} for 7 moneths?

This queſtion is of the nature of the former, and therefore to be anſwered after the ſame manner, placing the numbers as there they are placed, that is, putting that number in the middle, that wants his match terme, and ſo that the firſt and the fourth may be match termes, and likewiſe the ſecond and the fift match termes, that is to ſay, of one denomination, and of the ſame nature, thus, If 100^{li} in 12 months give 8^{li}, what will 660^{li} give in 7 moneths? or rather to diſtinguiſh the numbers alſo by their natures, thus, If 100^{li} ſtock in 12 moneths give 8^{li} Intereſt, how much Intereſt will 660^{li} ſtock give in 7 moneths?

Here, as is formerly directed, the firſt and ſecond multiplyed together make 1200, this is the diviſor; likewiſe the other three multiplyed together make 36960 for dividend: whereunto adding one cipher, and then dividing it by 1200. the quotient is 30^{li} and 8 primes, that is, 30^{li} and 16^{s} for the juſt Intereſt of 396^{li} for 7 months, after the rate of 8 per centum per annum. The diviſion (adding one cipher to the dividend) may be thus performed, 369600 . 1200. or (leaving out

out the 2 ciphers from each number, thus,

3696 . 12
308

And ſo ſtriking off one figure for the cipher put too, the Intereſt is preſently found to be 30li 16s as aforeſaid.

If 100li gaine 8li, or 160s in 12 months, in what time will 660li gaine 616s? This queſtion is not to be wrought after the manner of the two former, though the numbers are placed after the ſame manner, but in this and the like, the ſecond and the fourth numbers muſt be multiplyed together, to make the diviſor, and the other three to make the dividend; ſo 660 by 160 makes 105600 for diviſor; the other 3 numbers multiplyed together make 739200 for dividend; and ſo leaving out two ciphers from each number, I divide thus,

7392 .	1056
7392	2112
0000	3168
	4224
	5280
	(7

So this quotient being 7, ſhewes that in 7 moneths 660li will raiſe 616s, which is 30li 16s Intreſt after the rate of 8 per centum per annum.

If in 12 moneths 160s be raiſed by 100li, what ſumme

ſumme will in 7 moneths raiſe 616^{s}? This is to be wrought as the laſt, ſo that 160 multiplyed by 7 making 1120, muſt be the diviſor; the other three making 739200 muſt be dividend; and ſo leaving out one cipher from each number I divide thus,

73920	. 112
672	224
672	336
672	448
0000	560
	(660

And ſo this quotient being 660, ſhews that 660^{li} will in 7 moneths raiſe 30^{li} 16^{s} Intereſt, after the rate of 8 per centum per annum. And thus one work confirmeth another.

Queſtions wrought by the Rule of *Fellowſhip.*

SUppoſe there are eight owners of a Ship, each having an equall eighth part: ſuppoſe three of them buy out two of them for 675^{li}, whereof one buyer payes 300^{li}, another payes 200^{li}, and the third payes 175^{li}, ſuppoſe there grows due for fraight of this Ship 986^{li}, how ſhall it be divided

vided amongſt theſe 6 owners?

Firſt, it is to be underſtood, that they are to have each of them $\frac{1}{8}$ part, which is 125^{li} 05^{s} 00^{d}: then the chiefe queſtion is how the other $\frac{7}{8}$ parts ſhall be divided amongſt the three buyers. To doe this, you muſt ſay, If 675^{li} (being the money which they all three paid) give 246^{li} 10^{s} 00^{d} (which is the $\frac{7}{8}$) what ſhall 300^{li} give, what ſhall 200^{li} give, and what ſhall 575^{li} give?

The work may be done thus.

246^{li} 10^{s} or $246\frac{1}{2}^{li}$ by 300

73800
150

73950 by 675 (109555
675
1350
2025
2700
3375

06450
6075

3750
3375

375

This quotient is made a decimall number, by putting 3 ciphers to the dividend, in regard whereof, 3 figures muſt be ſtruck off from the ſaid quotient: the manner to accept them is formerly taught in my rules of practice.

Yet this diviſion I cut off when I have put but one cipher to it, and yet I put 2 figures more in the quotient, as if I had put to 2 ciphers more: the reaſon is, becauſe 375 falling againe to be the remainder muſt needs yeild me another 5 to put in my quotient, and ſo it would ſtill doe though

I ſhould proceed infinitely, for ſtill 375 would remaine; therefore this is to be obſerved in theſe decimall diviſions, that if the ſame number doe remaine againe that did remaine next before, you may put the ſame figure againe in your quotient as oft as you think good, without proceeding in the diviſion: And ſo ſtriking of 3 figures from this quotient, it appeares that he that paid 300li muſt have 109li 11s 01¼d out of the ⅞ bought & his own ⅛ 123.05.00

in all 232.16.01¼

246½li by 200

49200
100

49300 by the former diviſor
4725 wch is already prepared.

2050 73037
2025

2500 This quotient, ſtriking off
2025 3 figures, ſheweth that
he that paid 200li muſt
4750 have 73li 03s 09d be-
4725 ſides his owne ⅛ part
25

which is 123.05.00

in all 196.05.09

Now

Now if I take theſe 2 ſhares out of the $\frac{2}{3}$ parts bought, the remainder will be the third mans ſhare, thus,

109.11.1$\frac{1}{4}$	
73.00.9	246.10.00
182.11.10$\frac{1}{4}$	182.11.10$\frac{1}{4}$

ſo remains for the third mans ſhare 63.18.01$\frac{3}{4}$

But yet it will be good (for the approbation of the worke) to find out his ſhare alſo by the golden rule, thus,

246$\frac{1}{2}$ by 175

1722
1230

43050
87$\frac{1}{2}$

43137$\frac{1}{2}$ by 675

This Dividend, becauſe of the fraction, muſt be turned into angels, by doubling of it, alſo the diviſor muſt be doubled, and then work thus,

86275 . by 1350 (63907

8100
2700
4050
5400
6750

5275
4050

12250
12150

10000
9450

550

This quotient, ſtriking off 3 figures, doth ſhew his ſhare to be 63^{li} 18^{s} 01$\frac{3}{4}^{d}$, being the ſame that was found by ſubtraction, but finding this way, 3 ſummes, which being added toge-

ther,

ther, doe make the juſt ſumme that is to be divided amongſt them, it doth confirme the work to be true.

And ſo (to conclude) it appeares, that this ſumme of 986li is thus to be divided amongſt the 6 owners, viz.

to the firſt	232li.16s.01d¼
to the ſecond	196 .05.09
to the third	187.03.01¾
to the fourth	123.05.00
to the fift	123.05.00
to the ſixt	123.05.00
	986.00.00

This may ſerve for a direction for works of this nature concerning partnerſhip.

Another queſtion.

Foure partners make a ſtock to imploy in a buſineſſe, and it is covenanted that each mans ſhare of the profit that ſhall ariſe, ſhall be anſwerable to the ſumme of money that he puts in, and the time that the ſame is diſburſed.

The firſt puts in 750li, and at the end of 6 moneths hee takes out 150li: the ſecond puts in 600li, and at the end of 9 months takes out 100li: the third puts in 500li, and at the end of 12 moneths takes out 75li: the fourth puts in 450li,

and at the end of 15 moneths takes out 50li. And at the end of two yeares they are to divide the gaines which they find to be 658li. The queſtion is, what part thereof each one ſhall have. To doe this and the like, you muſt multiply each mans ſumme of mony by the time that the ſame is disburſed: which number muſt be the third in the golden rule to reſolve what his ſhare ſhall be, and there muſt be for each man a ſeverall worke. The firſt number in the ſaid rule muſt be the 4 numbers belonging to the 4 men added together, and the ſecond muſt be the gaines.

The worke may be done thus.

750li by 6 months.
3750
4500

600li by 9 mo
5400

600li reſting by 18 months.
12000
1200
10800
4500
15300

This is the firſt mans number.

500li reſting by 15 moneths.
2500
7500
5400
12900

The ſecond mans number.

500

500li by 12 moneths.

500

6000 425li reſting by 12 moneths.

425

5100

6000

11100 the third mans number.

450li by 15 moneths.

2250 400li reſting by 9 moneths.

6750 3600

6750

10350 the fourth mans number.

1530	0	650 the common multiplyer.	
1290	0	1316	1530. by 658
1110	0	1974	3290
1035	0	2632	1974
4965 the common diviſor.			1006740
9930			
14895			
19860			
24825			

So theſe 2 numbers being thus prepared, the one ſerves for the multiplyer, the other for the diviſor, in all the four workes: and you may obſerve, that having added the 4 numbers to make my diviſor, I leave out from each number a cipher, and then prepare the reſt.

So having found the firſt dividend to bee 1006740 I divide it by the ſaid diviſor, thus,

9930 (202767

13740
9930

38100
34755

33450
29790

36600
34755

1845

So this quotient ſtriking off 3 figures for the 3 ciphers put to, doth ſhew that the firſt mans ſhare will be 202li 15s 04¼d.

1290 by 658
1316
59220

848820 by 4965 the common diviſor.

4965 (170960

35232
34755

47700
44685

30150
25790

This quotient, ſtriking off 3 figures for the 3 ciphers put to, doth ſhew 170li 19s 02¼d to be the ſecond mans part.

1110

1110 by 658 : 03600
658
6580

730380 by 4965
4965 (147105
23388
19860
35280
34755
0525

5250
4965
28500
24825
3675

This quotient ſhews the third mans ſhare to be 147^{li} 2^{s} $1\frac{1}{4}^{d}$ and ſomewhat more.

1035 by 658
1974
3290

681030 by 4965
4965 (137166
18453
14895
35580
34755
8250
4965
32850
29790
30600
29790
810

This quotient ſhews the fourth mans ſhare to be 137^{li} 3^{s} 4^{d}.

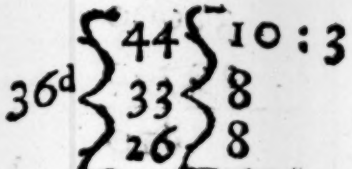
202 . 15 . 04¾	Thus each mans ſhare being added together, and making the juſt ſumme to be divided amongſt them, doth argue the work to be true.
170 . 19 . 02½	
147 . 02 . 01¼	
137 . 03 . 04	
658 . 00 . 00	

The Rule of *Allegation.*

THis rule teacheth to mix and compound, or to find the juſt price or worth of the maſſe or quantitie mixed or compounded, conſiſting of ſimples or ingredients of ſeverall priſes.

Briefly the work is thus.

A Farmer having three ſorts of grain for bread corne of ſeverall priſes, would mix them together (as he ſees occaſion) and ſo, that the quantitie mixed might be of one price which he ſets or propounds to himſelfe: this rule will direct him thus: Suppoſe he haue wheat of 3ˢ 8ᵈ the buſhell, rye of 2ˢ 9ᵈ the buſhell, and barly of 2ˢ 2ᵈ the buſhell, which he would ſo mix that the price of the mixed quantities might be 3ˢ the buſhell, The ſeverall prices turned into pence muſt be ſet downe thus,



This

This worke being preſently performed, is a full direction for this mixture. The manner is thus, Firſt I ſet downe by its ſelfe 36^{d}, being the ſet price, then I ſet downe 44^{d} being the price of the wheat, and then 33^{d} the price of the rye, and laſtly, 26^{d} the price of the barly. Then I link or couple together the higheſt and the loweſt, that is, the wheat with the barly, and obſerving the difference of each of them from the ſet price, I ſet downe thoſe differences differently thus, the difference of the barly I ſet againſt the wheat, and the difference of the wheat I ſet againſt the barly. Then I alſo link together the wheat and the rye, ſetting downe their differences as aforeſaid, and ſo I ſee that for every 8 buſhels of barly, there muſt be taken 10 buſhels of wheat; and for every 8 buſhels of rye, muſt be taken 3 buſhels of wheat: and ſo proportionably for a greater or leſſer quantitie, and ſo the price of ſuch a mixture will be 3^{s} the buſhell.

For tryall, Suppoſe there be taken 20 buſhels of rye, then there muſt be taken 7$\frac{1}{2}$ buſhels of wheat: ſuppoſe there be taken 12 buſhels of barly, then there muſt by this rule be taken 15 buſhels of wheat: now examine the particulars by their prices, and alſo the totall by the ſet price: if they agree, the worke is true, or elſe not.

20 buſh: at	2ˢ.9ᵈ	2ˡⁱ.15ˢ.0ᵈ
7½ buſh: at	3 .8	1 .07 .6
12 buſh: at	2 .2	1 .06 .0
15 buſh: at	3 .8	2 .15 .0
54½ buſh:	totall	8 .03 .06

54½ buſh: at 3ˢ is alſo 8ˡⁱ 03ˢ 06ᵈ.

Another queſtion.

A Vintner to 120 gallons of good Canarie at 3ˢ 4ᵈ the gallon, hath put 56 gallons of worſe canarie at 3ˢ the gallon, and 84 gallons of Mallego at 2ˢ 6ᵈ the gallon: The queſtion is, what will be the price of the gallon of this mixture.

Multiply the number of gallons of each ſort by the price thereof turned into pence, add thoſe 3 products together, and divide that totall by the whole number of gallons, the quotient gives the anſwer. For example,

120 gallons by 40ᵈ gives	4800	
56 by 36 gives	2016	
84 by 30 gives	2520	
totall	9336	by 260 gallons.

	780	520
	1536	780
	1300	1040
	236	1300
		(35 $\frac{216}{260}$

This work ſhews, that the price of theſe 260 gallons ſo mixt, will be 2ˢ 11ᵈ $\frac{236}{260}$ of 1ᵈ by the gallon, which is almoſt 3ˢ the gallon.

For

For tryall, 120 gallons at $3^s\ 4^d$ the gallon, is $20^{li}.00^s.00^d$

56 gallons at 3^s the gallon is $c8.08.00$
84 gallons at $2^s\ 6^d$ the gallon is $10.10.00$

all is $38.18.00$

And the whole mixture being 260 gallons at $2^s\ 11^d\ \frac{216}{260}$ of 1^d is $38^{li}\ 18^s\ 00^d$.
So the work appears true.

A queſtion of mixing of gold.

A Merchant hath 3 ingots of Gold to goe to the mynt, viz.

No. 1. $4^{li}.8^{oun}.9^{dwt}.18^{gr}$. worſe $1^{car}.2^{gr}\frac{1}{3}$
2. $3.9.6.14$ worſe $0.3\frac{3}{4}$
3. $3.2.4.00$ worſe $0.1\frac{1}{4}$

The queſtion is, how much fine gold of 22 carrects fine will make theſe 3 ingots ſtanderd of 22 carrects fine.

Car:		
22	$24^{car}.0^{gr}.0^{q}$	$26.15.5$
	$20.1.2$	32
	$21.0.1$	32
	$21.2.3$	32

Here you ſee I ſet downe the fineneſſe of the 4 parcels to be mixed, and the 22 carrects ſtanderd I have ſet alſo downe, but it ſtandeth by its ſelfe: then I link together the fine gold, and the ingot No. 1. the difference of the fine gold above ſtanderd

ſtanderd being turned into quarters of graines, becauſe all muſt be of one denomination, is 32 quarters: that I ſet againſt the ingot, the differéce of that ingot under ſtanderd being 26 quarters, I ſet againſt the fine gold: and ſo conſequently linking the fine gold with each of the other ingots, and ſetting down the differences as aforeſaid, it preſently appears that for every 32 grains that is in ingot N°. 1. there muſt goe 26 grains of fine gold to make it ſtanderd: for every 32 graines that is in ingot N°. 2. there muſt goe 15 graines of fine gold, and for every 32 graines that is in ingot N°. 3. there muſt goe 5 grains of fine gold to make it ſtanderd, ſo that if the ingots were 32 ounces a piece, then 46 ounces of fine gold would make them all ſtanderd of 22 carrects fine. But becauſe they are of other ſeveral weights, therefore the golden rule muſt helpe to find how much fine gold will make them ſtanderd. And now I muſt be faine to bring each ingot into one denomination, that is, into graines, ſo I find that

N°.1 qt.27114 gr
2 qt.21758
3 qt.18336

Then I ſay, for N°.1. If 32 require 26, what will 27114 require? By multiplying and dividing I find it will require 22030 gr and $\frac{2}{16}$

N°.2. will require 10199 and $\frac{1}{17}$

N°. 3. will require 02865

ſo

so all the fine gold required to make them standard } 35094 gr. and 3/16

which reduced is 6 li. 1 oun. 2 dwt. 6 gr 3/16

If this work be carefully performed, it may passe without tryall, because the tryall is somewhat troublesome, which is thus: The fineneſſe of each ingot must be turned into quarters of carrect graines, also the 24 carrects fine gold, must be turned into quarters of carrect graines, so it will appeare that each ounce of fine gold

containes	384 quarters.
each ounce in ingot N°. 1 qt.	326 quarters.
each ounce in ingot N°. 2 qt.	337 quarters.
each ounce in ingot N°. 3 qt.	347 quarters.

Then must be taken the ordinary graines in one ounce, which is 480 graines: These numbers must be applyed to the golden rule, thus,

If 480 graines give 384 quarters, what will 35094 graines of fine gold required give? By multiplying & dividing it wil be foūd 28075 96/480

so for ingot N°. 1. if 480 give 326, what 27114?

it will be	18414 444/480
so ingot N°. 2. wil be found to contain	15275 446/480
N°. 3. will be found to containe	13255 192/480
all is as appeares	75021 218/480

Now

Now reſteth for tryall, to ſee if the whole quantitie of the 3 ingots, and fine gold required, after 22 carrects to the ounce, will give the ſame number of quarters that is found by the addition of the particulars: The whole number of graines is thus, fine gold $35094\frac{3}{16}$

ingot No. 1.	27114
ingot No. 2.	21758
ingot No. 3.	18336
	$102302\frac{3}{16}$

This muſt alſo be brought to the golden rule, thus,

If 480 give 352, what $102302\frac{3}{16}$? by multiplying and dividing it will be found to give $75021\frac{224}{480}$ where there is only $\frac{6}{480}$ of one quarter of a graine difference; and that happens, becauſe in this tryall, I doe not meddle with the fraction of $\frac{3}{16}$, which $\frac{8}{480}$ will juſt riſe thus: $\frac{3}{16}$ multiplyed by 384, and that divided by 480 gives $\frac{2}{16}$, and $\frac{192}{480}$ of $\frac{1}{16}$, the ſame $\frac{3}{16}$ multiplyed by 352, and that divided by 480 gives $\frac{2}{16}$, and $\frac{96}{480}$ of $\frac{1}{16}$. Now this $\frac{2}{16}$ and $\frac{96}{480}$ of $\frac{1}{16}$ being taken out of $\frac{2}{16}$ and $\frac{192}{480}$ of $\frac{1}{16}$ leaves $\frac{96}{480}$ of $\frac{1}{16}$, which by dividing the ſaid 96 by 16 gives juſt $\frac{6}{480}$ more to be added to $\frac{218}{480}$, the fraction ariſing by the addition of the particulars, and then it will be $\frac{224}{480}$ agreeing juſt with the fraction ariſing by the whole quantity caſt up, after 22 carrects to the ounce, as formerly appeares.

The

The Rule of *Falſhood.*

THis Rule is ſo called, becauſe it findeth out the truth by way of falſhood, or falſe ſuppoſitions: and though it be not much uſed in way of trade or ordinary buſineſſe, yet it ſerveth well to anſwer divers queſtions which cannot aptly be applyed to the former rules. As this for one.

A Gentleman agrees with a Gardiner to plant him 50 trees of ſuch fruit as he liketh: And it is agreed betweene them, that for every one of the 50 trees that growes and proſpereth, the Gardiner ſhall have 10ˢ: and for every tree of the ſaid 50 that dies and proſpereth not, the Gardiner ſhal forfeit 10 groats. Now when the trees were planted, and an account taken how many proſpered, and how many proſpered not, the Gardiner received in full ſatisfaction according to their ſaid agreement, 15ˡⁱ 13ˢ 04ᵈ. Now the queſtion is, how many trees proſpered, and how many did not proſper.

Now this rule of falſhood will reſolve this and the like queſtions, having no other ground but two falſe gheſſings to worke by, thus. Firſt, I gheſſe that 30 of the trees proſpered, then 20 of them muſt faile: If 30 proſpered, hee ſhould receive for them 15ˡⁱ 00ˢ 00ᵈ: and for the 20 that failed, he ſhould forfeit 3ˡⁱ 06ˢ 08ᵈ, which taken

out

out of 15.00.00, there reſteth 11^{li} 13^{s} 04^{d}: therefore this gheſſe doth appeare falſe, and the difference or error is juſt 4^{li} too little, which I turne into pence, and then ſet downe the ſame over againſt the firſt poſition, thus,

30 Z 960

Then I gheſſe againe that 34 proſpered, then 16 muſt faile: If 34 proſpered, for them he muſt receive 17^{li}, and for the 16 that failed, he ſhould forfeit 2^{li} 13^{s} 04^{d}, which taken out of 17^{li}, reſts 14.6.8. which taken out of 15.13.04, there reſteth 1.6.08^{d} too little, which I turne into pence, and ſet it down for my ſecond difference after my ſecond poſition, thus.

30 Z 960
34 Z 320

Then I multiply croſſewiſe 960 by 34, it yeeldeth 32640, alſo I multiply 320 by 30, the product is 9600. Now becauſe theſe differences are both alike, that is, both too little, I muſt work by ſubtraction, whereas if they had been unlike, that is, the one too little and the other too much, I muſt then have wrought by addition, but in this, I ſubtract my ſecond product 9600 out of my firſt product 32640, the remainder muſt be my dividend, being 23040. Likewiſe I ſubtract 320 my leſſer error from 960 my greater error, the remainder being 640 muſt be my diviſor, which di-

diviſion being performed, the quotient gives the anſwer, thus,

	23040	by 640
	1920	1280
		1920
This quotient, being 36, ſhews	3840	2560
that 36 of the trees proſpered,	3840	3200
and then 14 muſt faile.	0000	(36

For tryall, 36 at 10^{s} a peece, is 18^{li}, and 14 forfeiting 10 groats a piece, is 2^{li} 6^{s} 08^{d}, which taken from 18^{li}, reſteth 15^{li} 13^{s} 04^{d} for the Gardiner to receive.

Another queſtion.

A certain man having 2 ſons and 2 daughters, being to make his Will, and not knowing juſtly his eſtate, after ſome Legacies bequeathed, doth give all the reſt of his eſtate (as it ſhould bee found) amongſt his children, ſo that his eldeſt ſonne ſhould have 50^{li} more then his yongeſt ſonne, and yet the ſaid yongeſt ſon ſhould have 20^{li} more then his eldeſt daughter, and his eldeſt daughter ſhould have 10^{li} more then his yongeſt daughter: now his eſtate after debts and other Legacies deducted, is found 856^{li}: the queſtion is, what ſhall be each childs portion. Now ſeeing the eldeſt ſonnes portion will direct for the reſt, I firſt gheſſe at his, ſuppoſing it will bee 100^{li}, then the other ſonnes muſt be 50^{li}, the eldeſt

deſt daughters 30li, and the yongeſt daughters 20li, all which make but 200li, and ſhould bee 856li: therefore here is an error of 656li too little, and becauſe I would ſhew the way to work by addition, which (as I ſaid) muſt be when the errors are the one too much and the other too little, whereof notice muſt be taken in the tryall, I will therefore now ſo gheſſe, that the error may be too much, ſeeing the former is too little, I doe therefore gheſſe that the eldeſt ſonnes portion will be 400li, then the ſecond ſons portion muſt be 350li, the eldeſt daughters muſt be 330li, and the yongeſt daughters muſt be 320li, all which doe make 1400li, and ſhould bee 856li: therefore here is an error of 544li too much, then I ſet downe my two ſuppoſures together with their errors, thus,

100li 656
400 544

Then I multiply croſſewiſe 656 by 400, it makes 262400, and 544 by 100, it makes
54400

316800 this is the totall of both, now added together, becauſe the errors are unlike, then adding the two errors together, they make 1200li. And now becauſe here is two ciphers in this dividend, and alſo in this diviſor, therefore I onely divide 3168 by 12, leaving out all the ciphers, and

and that is done thus,

3168	12
24	24
	36
76	48
72	60
48	(264
48	
00	

Now this quotient being 264li, tells mee that the eldeſt ſonnes portion muſt be 264li.

If the eldeſt ſonnes portion be 264li
the other ſonnes muſt be 214
the eldeſt daughters 194
and the yongeſt daughters 184
856

All which doe make 856li the juſt ſumme to be divided amongſt them: and thus you ſee how this excellent rule doth extract truth out of falſhood.

Now, I am not ignorant, that both theſe queſtions (being well obſerved) may eaſily be anſwered otherwiſe; only this ſerveth to ſhew (as I ſaid) how this rule doth fetch truths out of errors.

Another queſtion

A Merchant gives order to his ſervant to pack 4 fatts of Jeans fuſtians, viz. two of whites, and two of ruſſets, and to ſhip them off in ſuch a veſſel, for ſuch a port. The ſervant doth ſo, taking

n a paper the ſeveral contents of each fatt, but after they were ſhipped, and he to give an account to his Maſter what fuſtians he had packed, and how many in each fatt, that his Maſter might accordingly adviſe his Factor, the paper wherein he had taken the contents could not be found, ſo the ſervant is in a great ſtrait for want of it, and knows no more towards helping himſelfe in the buſineſſe, but only thus much, he knew how many ruſſets were in the warehouſe, and by the remainders hee finds that they have packed 257 peeces of ruſſets, but how many of them are in a fatt he knowes not, and as for the whites, he neither knows how many are in a fatt, nor how many are packed in all; hee therefore goes to the packers to ſee what helpe they can afford him: They remember no more but this, that they did obſerve in the packing, that the fat nº. 2. held 10 peeces more then the fatt nº. 1. and that nº. 3. held 15 peeces more then nº. 2. and that nº. 4. held 20 peeces more then nº. 3. they remember alſo that the ruſſets were packed in nº. 1. & nº. 3. and the whites in nº. 2. and nº. 4. now except the ſervant can upon this intelligence make his Maſter an exact account of the packing of the fuſtians, he knowes hee ſhall be ſeverely checked for his negligence, and then remembring that he had learned this rule of Falſhood, and that it taught the anſwering of ſuch kind of queſtions, he thought

thought he would now see, if it would stand him in any stead: And so first, ghessing that in nº.1. were packed 100 pieces of russets: then (by the packers relation) in nº.2. must be 110 pieces of whites: in nº.3. 125 peeces of russets, and in nº.4. 145 peeces of whites, but then adding together 100 and 125, he finds they make but 225 russets, and should be 257, therefore he findeth here an error of 32 too little; then he ghesseth again that in nº.1. is 110 russets, then in nº. 2. must be 120 whites: in nº. 3. 135 russets, and in nº. 4. 155 whites; but then adding the russets together, he findes they make but 145, and should bee 157. therefore he findeth here an error of 12 too little, then setting downe the positions and their errors thus,

100 Z 32
110 Z 12

And multiplying crossewaies there ariseth 3520, and 1200: and now (because the errors are alike) subtracting the lesser number from the greater, there resteth 2320: subtracting also the lesser error from the greater, there resteth 20, by wch dividing 2320, the quotiēt is 116, so that now he is able to give his Master an account, that in nº.1. is 116 pieces of russets, in nº.2. is 126 pieces of whites, in nº.3. is 141 pieces of russets, and in nº.4. is 161 pieces of whites: russets 257, whites 287, in all, 544 pieces. And so with a little trouble

he gives his master as just an account, as if he had not lost the paper wherein he took the particular contents of the 4 fatts when they were packed. Now I know this question may also be more easily answered another way, but thus much for variety, and to shew the operation of this rule.

Another question.

A Merchant taking account of his Cash-keeper what mony he had in Cash, took half thereof to his own custody, & at the end of the next month he asked his man how much hee had received more then paid that moneth since he last accompted with him; hee answered, 139li 12s 00d, whereupon the master againe tooke one halfe of the whole money then in cash to his owne custodie, and againe at the end of the next month he asked his man how much hee had received more then paid that moneth, hee told him, 127. 14.00. whereupon his master againe tooke one halfe of the whole money in cash to his owne custodie, now this summe last taken by the master, was 154li 17s 00d: The question is, how much he took from his man to his own keeping in all.

If there be any difficulty in this question, it is to know how much money was in cash when he first accounted with his man, for that being found

found, the reſt is eaſie; I will therefore gheſſe at that, ſuppoſing there was 100li in caſh; Then the the Maſter taking halfe, leaves 50li in caſh, which with 139li 12s 00d increaſed the next moneth is 189li 12s: The Maſter then taking halfe thereof, leaves 94li 16s 00d in caſh, which with 127. 14. 00. increaſed the next moneth, is 222. 10. 00. whereof one halfe is 111. 05. 00. but it ſhould be 154. 17. 00. ſo here is an error of 43. 12. 00. which brought into one denomination, is 872s my firſt error. Then I gheſſe againe, that there was 110li in caſh, then by order of the queſtion, the Maſter muſt firſt take 55li, the next moneth hee muſt take 97. 06. 00. and the third time hee ſhould take 112li 10s 00d, but it ſhould be 154li 17s 00d: the error is 42li 07s 00d, which is 847s my ſecond error. Then I ſet downe my two poſitions and their errors, thus,

100 Z 872
110 Z 847

Then multiplying croſſe wiſe there ariſeth 95920 and 84700, and then ſubtracting the leſſe from the greater, there reſteth 11220 my dividend, likewiſe ſubtracting the leſſer error from the greater, there reſteth 25 my diviſor, by which I divide the 11220, adding one cipher to

it thus,

112200.	25
100	50
	75
122	100
100	125
220	
200	(4488
0200	

Here the quotient, being (by the addition of that one cipher to my dividend) made a decimall number, is 448li, and 8 primes, which is 16s.

So I conclude, that there was 448li 16s 00d in cash, when the Master first accounted with his man, halfe whereof taken into his owne charge, leaves 224.08. in cash, which with 139. 12.00. the next moneths increase makes 364. 00. 00. whereof the Master then taking one half, leaves in cash 182. 00. 00. which with 127. 14.00. the next moneths increase is 309. 14.0. whereof one halfe taken by the master, is 154. 17. 00. agreeing with the question propounded, so it appears that the master tooke into his own hands these three summes,

	124. 08. 00
	182. 00. 00
	154. 17. 00
in all, the summe of	461. 05. 00

This question may also be answered another way:

way: And though (as I ſaid) theſe queſtions doe ſeldome fall in the way of ordinary trade and commerce, yet foraſmuch as ſuch queſtions may be propounded, it is good to know how to anſwer them: I will therefore propound one more, and ſo leave this rule.

Two men being partners had debts owing them by ſeverall men, amounting to the ſumme of 1280li: And both of them endeavouring to receive in what they could of their debts, after a certaine time they reckoned what each of them had received: and it was found, that one of them had received more then the other, inſomuch that hee paid to his partner the fourth part of that which he had received, and withall gave order to his partner to receive in the reſt of the debts yet ſtanding out, and when hee had received all, to pay him what ſhould be due to make up his halfe part of the whole debts; which he did, and then paying to his partner the tenth part of all that hee received of the debtors, their ſhares were made equall. The queſtion is, how much each of them did receive of the debtors.

This queſtion I conceive to be the hardeſt here propounded, eſpecially to be anſwered by the way of ordinary Arithmetick, by reaſon of the diverſitie of fractions that the work, and the examination of the work will beget, I will therefore do it by the way of the decimall Arith-

metick (wherein you may gather ſome underſtanding by the manner of the work inſuing.) Now I doe firſt ſuppoſe, that the firſt man received 480li, the fourth part whereof being paid to the other, leaves him 360li: now if the firſt received 480li, the other receiving all the reſt, muſt receive 800li, whereof the tenth part being paid to the firſt, makes the 360li remaining with him 440li, but by the queſtion it ſhould be 640li, therefore here is an error of 200li: Then I ſuppoſe that the firſt received 380li, whereof paying the fourth part to his partner, leaves him 285li, whereunto 90li being the tenth part of 900li which the ſecond muſt receive, being added, it makes 375li, but it ſhould be 640li, ſo here is an error greater then the firſt, being 265li, then I ſet downe my two poſitions and their errors, thus,

480 Z 200
380 Z 265

And then multiplying croſſewiſe, there ariſeth 127200, and 76000, the leſſer whereof being ſubtracted from the greater, leaves 51200 the dividend, then likewiſe ſubtracting the leſſer error from the greater, there reſteth 65 my diviſor, by which I divide 51200, putting firſt 4 ciphers to it, thus,

512=

```
512000000 . 65
455         130
---         195
 570        260
 520        325
 ---       ----
  500      (7876923
  455
  ---
   450
   390
   ---
    600
    585
    ---
     150
     130
     ---
      200
      195
      ---
       05
```

Now this quotient, striking off 4 figures for the 4 ciphers put to, is 787^{li} 6 primes, 9 seconds, 2 thirds, and 3 fourths, and shews that the first did receive 787^{li} 13s 10^{d} farthing, or thereabout.

Now to examine this otherwise then by way of decimall numbers, would beget fraction upon fraction, and would be both tedious and troublesome. I doe therefore turne the whole debts being 1280^{li} into a decimall number, by adding as many ciphers thereunto as I did to my dividend

dend, then I ſubtract from it my quotient, being the money that the firſt received, thus,

12800000
7876923

4923077

This remainder is the money that the ſecond man did receive, which is in coine 492. 06. 01¾. or thereabouts. Then I take from the number which ſheweth what the firſt did receive, the fourth part of it ſelfe, thus,

7876923
1969230¾

ſo reſteth 5907692¼, to which I ad the tenth part of that which the ſecond received, thus,

5907692¼
4923077/10

6399999

Now theſe 2 numbers (the one being that which remained with the firſt man after hee had payd the fourth part of that which he received, to the ſecond man, and the other being the tenth part of that which the ſecond man received, which hee was to pay to the firſt) being added together, without regarding the 2 fractions of ¼ and 7/10, which in this caſe are not materiall, the reſt as appears doth make 639li 9 primes, 9 ſeconds, 9 thirds, and 9 fourths, which doth demonſtrate 640li the juſt halfe of the whole debts due

due to the firſt man, according to the queſtion: And though this number 6399999 doe not plainly expreſſe 640li, yet it is to be underſtood, that when 4 or 5 fraction figures in theſe decimall numbers doe thus ſucceſſively run upon nines, they doe alwaies betoken 1 unite, which here is 20s or 1li: ſo here being 639li in whole numbers, and 1li more in fractions, doth make 640li as aforeſaid. And now, though it muſt needs follow that the ſecond man having the reſt of 1280li, hath alſo 640li, yet it will not be amiſſe to find it out alſo by examination, it hath beene found that

the ſecond man did receive	4923077
from which taking the tenth part is	$492307\frac{7}{13}$
ſo reſteth	$4430769\frac{3}{13}$
whereunto add $\frac{1}{4}$ of that which the firſt received, is	$1969230\frac{3}{4}$
	6399999

Here alſo omitting the fractions as not materiall, the addition of the reſt is 6399999, which alſo repreſenteth 640li, and confirmeth the worke. And this queſtion thus wrought, ſets forth [illegible] the worth of this rule, and of decimal Arithmetick, of which (if this Treatiſe find acceptance) I purpoſe (God willing) to write ſomwhat hereafter.

Equa-

Equation of Payments.

IF 345li be to be paid as followeth: 84li at 4 months, 56li at 7 months, 98li at 11 months, & the reſt being 107li at 13 months, at what time ſhould it be all paid at one payment?

Multiply every ſeverall payment by his time, add the products, and divide their totall by 345, the quotient gives the anſwer.

84	by 4	gives	336
56	by 7	gives	392
98	by 11	gives	1078
107	by 13	gives	1391
345			3197
			3105
			92
92	by 30 daies		30
			2760
			2760
			0000

345
690
1035
1380
1725

(9 mo and 8 daies as here appears.

If 428li be to be paid as followeth.

56	ready money		
120	at 6 moneths		
160	at 8 moneths		
92	at 12 moneths		
120	by 6	is	720
160	by 8	is	1280
92	by 12		1104
			3104

3104 to divide by 428

	2996	856
	108	1284
108 by 30	30	1712
	3240	2140
	2996	(7m° 7 daies & $\frac{244}{428}$
	244	

Thus it appeares that at the end of 7 months, 7 daies and a halfe, or there abouts, all this 428li ought to be paid at once.

But if the mony be to be paid by equall payments, as is moſt uſuall, then you may goe this eaſie way: A ſumme of money being to be paid at 5 ſix moneths, when ought it to bee paid at once?

Take the fift part of each ſeverall payment, add thoſe parts together, the totall gives the anſwer, thus,

$\frac{1}{5}$ of 6 moneths is $1\frac{1}{5}$
$\frac{1}{5}$ of 12 moneths is $2\frac{2}{5}$
$\frac{1}{5}$ of 18 moneths is $3\frac{3}{5}$
$\frac{1}{5}$ of 24 moneths is $4\frac{4}{5}$
$\frac{1}{5}$ of 30 moneths is 6

18 moneths the juſt time when the whole ſumme is to be paid at once.

And

AND now for variety, and that the learner may be affected with this Art of number, I will briefly ſet down three or foure obſervations of mine, which being of little uſe but to delight the minde, may paſſe under the name of *Recreations.*

The firſt is this:

Suppoſe three men have each of them a certaine ſumme of Money, and you are to diſcover how much each of them hath, you may preſently doe it, by demanding and taking notice how much the firſt and the ſecond have together, alſo how much the ſecond and third have together, and laſtly, how much the third and the firſt have together. For if you take from the halfe of that totall that which the ſecond and third have, there will remaine that which the firſt hath, which taken from that which hee and the ſecond have, there will remaine that which the ſecond hath, and likewiſe being taken from that which hee and the third have, there will remain that which the third hath. It is very eaſie (the way being thus ſhown) but otherwiſe hard and difficult: Suppoſe the firſt and ſecond have 40^{li}, the ſecond and third 57^{li} 10^{s}, and the third and firſt 48^{li} 16^{s} 08^{d}, you may by this rule preſently conclude that

the

the firſt hath 151i 13s 04d, the ſecond 24li 06s 08d, and the third 33li 03s 04d.

Alſo you may bid your friend thinke in his mind, or ſet downe with his pen any number of pence that can be writ with three, foure, or five figures, then bid him turne thoſe pence into farthings, and thereunto bid him add 15 farthings more; then bid him multiply that number by 5, and to that product bid him add any number of farthings that can be writ with 1 figure: then hee letting you ſee that totall, doe but take from it 75, and then the figure reſting next the right hand, is that number of farthings which was laſt added in, halfe the reſt is the number of pence which he thought.

This rule is plaine, and needeth no example, eſpecially ſeeing I deſire not to have this volume inlarged with theſe things which are more for pleaſure then profit.

Alſo you may bid bid your friend think any number of ſhillings which may be writ with 4 or 5 figures, or more (but for the tedieuſnes) thē bid him turne thoſe ſhillings into pence, or into halfe pence (if you pleaſe) then bid him add to that number 15, and then multiply that number by 5, then bid him add to that product any number of pence or halfe pence that may bee writ with one figure, and then he giving you that totall

tall, take away 75; and then for pence take $\frac{1}{8}$ of the reſt, for halfe pence take $\frac{1}{11}$, leaving the laſt figure out: for (as I ſaid) that ſheweth what number of pence or halfe pence was laſt put to.

But that which paſſeth the reſt, and to common reaſon may ſeeme impoſſible, let your friend thinke any number of pounds that may be writ with foure or five figures, or more, if hee be expert in doing what you require, then let him turne thoſe pounds into pence, then you may give him liberty to add thereunto any number of pence that hee ſhall thinke good under 200, ſo that the laſt figure of the number that hee addeth thereunto be 5, then let him multiply that number by 5, and to that product give him liberty to add any number of pence more under 20 at his owne choice: then let him give you only that number which is the totall, which you obſerving, may preſently ſet downe under that number.

Firſt, the number of pounds, whereof came the firſt number of pence, then the number of pence which hee firſt added in, and laſtly, the number of pence which he laſt added in. The Rule to a reaſonable memory is eaſie and very certaine.

And here I will ſet you downe an example,

Sup-

Suppose the number of pounds is
59647li

1192940s
119294

14315280d
189 added in.

14315465
71577325 product by 5
17 added in.

71577342
59647:185:17

Now this last number, viz. 71577342, is only presented, under which the solution is to be set, as here I have done; by observing of which, together with my former Rules, a reasonable capacitie may be able to doe the like: And for the rest, I leave them to admire it, as such a kind of Arithmeticall divination as hath not yet been taught by any: And yet somewhat may be added to this, to make it seeme yet more impossible, for you may bid the party turne the number of pounds into farthings, then bid him add thereunto any number more, under 900, so that the last figure be 5 as aforesaid; then bid him multiply that number by 5, then bid him add thereunto any number more under 20, and then giving you that totall, you may easily set downe under

the ſame firſt the number of pounds, whereof came that number of farthings, then the number firſt added in, and laſtly, the number laſt added in, thus,

86574^{li}
1731480^{s}
1731480

20777760^{d}
83111040^{q}
785 added in.

83111825
415559125 product by 5
18 added in.

415559143 the number preſented.
346299
$86574 . 785 . 18$ ſolution.

But foraſmuch as this will not very eaſily be conceived without ſome directions, take therefore briefly my Rule, which that it may be the better borne in mind, I have put in verſe or meeter, and is this:

If 6, by laſt figure (ſave one) be exceeded.
from it and the laſt, take 75 out,
If not, leſſe by 50, let this be well heeded,
& what was laſt added, 'twill ſhew without doubt.
The twelfth of the reſt, being quartered, are pounds,
the doubled Remainder, augmented by one,

If

2	3	4	5	6	7	8	9	1
4	6	8	0	2	4	6	8	2
			1	1	1	1	1	
2	3	4	5	6	7	8	9	1
6	9	2	5	8	1	4	7	3
		1	1	1	2	2	2	
2	3	4	5	6	7	8	9	1
8	2	6	0	4	8	2	6	4
	1	1	2	2	2	3	3	
2	3	4	5	6	7	8	9	1
0	5	0	5	0	5	0	5	5
1	1	2	2	3	3	4	4	
2	3	4	5	6	7	8	9	1
2	8	4	0	6	2	8	4	6
1	1	2	3	3	4	4	5	
2	3	4	5	6	7	8	9	1
4	1	8	5	2	9	6	3	7
1	2	2	3	4	4	5	6	
2	3	4	5	6	7	8	9	1
6	4	2	0	8	6	4	2	8
1	2	3	4	4	5	6	7	
2	3	4	5	6	7	8	9	1
8	7	6	5	4	3	2	1	9
1	2	3	4	5	6	7	8	
2	3	4	5	6	7	8	9	1

this next page 62.

Directions for the Table beforegoing.

THe lowest figures in the squares of this Table are articles, the highest, digits. If I would multiply 947 by 8, (reading the product, by looking on the table) then I looke in the overthwart Columne that hath 8 at each end, and there I begin with the article under the figure 9, which is 7, and because there is three places in this multiplicand, there must be 4 in this product, therefore I call that 7 seven thousand, then carrying the digit 2 in the same square to the article 3, under 4, they make 5, that I call five hundred; then carrying the digit 2, in that square, to the article 5, under 7, they make 7, that I call 70; then having no other square to carry the digit 6 unto, I call it only 6, and reading the product of 947 multiplyed by 8, I find it to be 7576. But if there be more figures in your multiplicand, then it will be best to begin with the figure in the first place, and set downe first the digit under that figure, carrying the article in that square to the digit in the square under your next figure, and so on, till you have gone through all the figures in your multiplicand, then goe to the Columne belonging to the next figure in your multiplyer, and doe likewise, &c.

If

If I would multiply 85964 by 796, I looke in the columne which hath 7 at each end, and there in the ſquare under 4, I find the digit 8, which I ſet downe, carrying the article 2 to the digit 2 in the ſquare under the next figure which is 6, which article and digit making 4, I ſet it downe by the 8, and proceeding in this manner, I finde the number which is the product of 85964, multiplyed by 7, to be 601748, then going to the columne which hath 9 at each end, I find the product by that figure to be 773676, that I ſet down under my other number, gaining a place towards the right hand, and in the columne anſwering to the laſt figure in my multiplyer which is 6, I find the product to be 515784 which 3 numbers being placed thus,

601748
773676
515784

And then added together, their totall is the juſt product of 85964 multiplyed by 796.

68427344

Now for Diviſion: If I would divide 456789 by 796, I ſee 4567 is the number from which the firſt ſubtraction is to be made; ſo I looke in the head of the Table for the figure 7, (being the firſt writ figure in my diviſor) downe which columne I deſcend, (looking in it, and in the columne under my next diviſor figure which is 9) for the number next under 456, which in the

fifth

fifth column I find to be 398, (for I ſee the ſixth columne would be too much) ſo I conclude, 5 is my firſt quotient figure, then taking the product of my whole diviſor, as I find it multiplyed by 5 in the ſaid fifth columne, which is 3980, from 4567, there reſteth 587, the next figure drawne downe to it makes 5878: Then, deſcending from 7 as aforeſaid, I find in the ſeventh columne 5572, which I ſubtract from 5878, ſetting 7 in my quotient, then I deſcend again from the ſaid 7, till I come to the third columne, where I find 2388, which I take from 3069, ſetting 3 in my quotient, ſo my quotient is 573, and 681 remaines. And ſo much for this buſineſſe, which I leave for practice to make eaſie.

If that the ſaid figure exceeds the ſaid bounds, els not, with 5 lengthned, the number makes known That firſt was in added. Loe thus have you got the way to untie this ſo difficult knot.

And yet further (which ſhall be the maſterpiece of this buſineſſe) the number of pounds being turned into farthings, cauſe that number to be multiplyed by 20, to that product let any number be added under 19150, ſo that the laſt figure be 5, let that totall be multiplyed by 5, then to that product let any number be added under 40: Now this laſt totall only being preſented, yon may from it (with ſmall trouble) collect the ſolution. Example,

Suppoſe the number of pounds be 95768, the number firſt added in 18795, and the number laſt added in 37, then the number preſented will be

91938 22012
766151
95768. 18795. 37 ſolution.

9
849
939

And thus I end this Treatiſe, which may gain ſo good liking, that I may happily be encouraged hereafter to inlarge it with a neceſſary addition touching decimall Arithmetick.

FINIS.